Australian Journal of

# EMERGENCY MANAGEMENT

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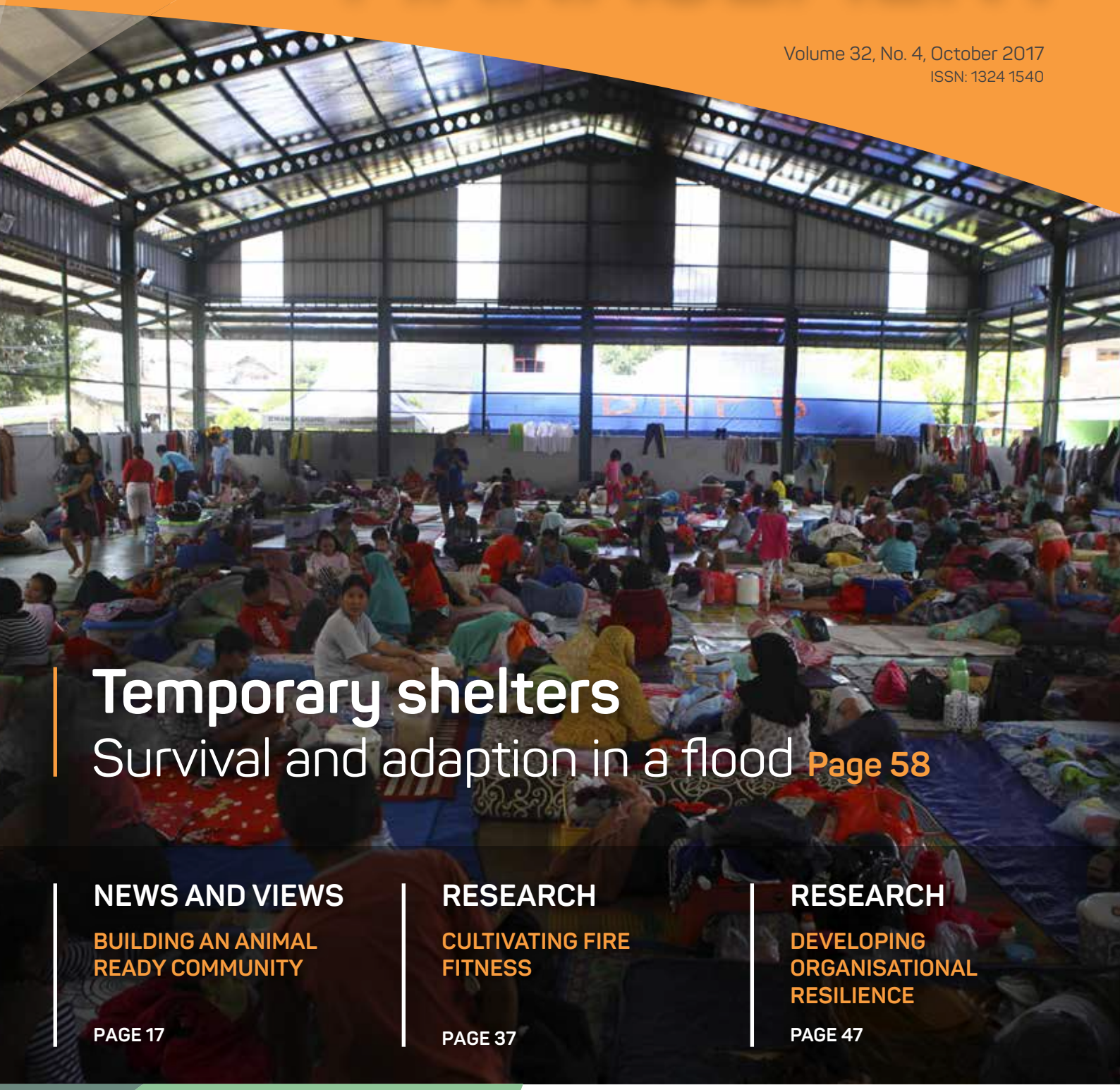

## Temporary shelters

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Australian Institute for Disaster Resilience

# Australian Journal of Emergency Management

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## About the Journal

The *Australian Journal of Emergency Management* is Australia's premier journal in emergency management. Its format and content are developed with reference to peak emergency management organisations and the emergency management sectors—nationally and internationally. The Journal focuses on both the academic and practitioner reader. Its aim is to strengthen capabilities in the sector by documenting, growing and disseminating an emergency management body of knowledge. The Journal strongly supports the role of the Australian Institute for Disaster Resilience (AIDR) as a national centre of excellence for knowledge and skills development in the emergency management sector. Papers are published in all areas of emergency management. The Journal encourages empirical reports but may include specialised theoretical, methodological, case study and review papers and opinion pieces. The views in the Journal are not necessarily the views of the Australian Government, AIDR or AIDR's partners.

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Cover image: Widespread flooding occured in the Pondok Persada residential area in November 2016 in Tangerang, Indonesia. According to the National Disaster Management Agency of Indonesia, more than 4,000 people were forced to evacuate after water overflowed an embankment Seasonal rain and high tides cause widespread flooding in Indonesia.

Image: Solo Imaji, Barcroft Images

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All articles must contain an abstract and a small biographical paragraph about each author. A Copyright Release form and the Editorial Policy are available on the website. Authors should familiarise themselves with the Journal before making a submission. Contributions should be forwarded electronically to ajem@aidr.org.au. All research articles are peer reviewed. The *Australian Journal of Emergency Management* is indexed by several indexing organisations throughout the world.

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## News and views



## Research



Contributions in the Research section of the *Australian Journal of Emergency Management* are peer-reviewed to appropriate academic standards by independent, qualified reviewers.

# Foreword

Joe Buffone, Emergency Management Australia

Welcome to the October edition of the *Australian Journal of Emergency Management*. The journal is an important publication that shares insights, knowledge and experiences across the disaster management community. It provides the opportunity to publish contemporary ideas and stimulate debate that shapes disaster management policies and practices.

Our world is forever changing; the current geo-political environment, security and climate risks are rapidly changing. Australia lies in the most disaster-prone region in the world and continues to experience more frequent and severe weather conditions that increases the risk of heat, fire and extreme weather events.

The drier-than-average climate conditions experienced this winter suggest that the southern fire season is likely to commence earlier and be more active than normal. Fire and emergency services across the country are very active in their preparations for the onset of this season.

Our emergency services, emergency management agencies and leaders are well-trained, equipped and practiced to manage the current risks and shocks that face our communities.

The question we need to answer is: how well prepared we are for an existential risk? Are our collective capabilities agile and adaptive to cope with an event beyond our imagination and current experiences?

In a previous issue of AJEM, Mark Crosweller, Director General Emergency Management Australia, stated that 'we should approach the problem of catastrophic natural disasters differently by changing the way we think about them to better manage these events'.

Accepting the inevitability of a catastrophic event that results in consequences that are beyond our current arrangements, thinking and experiences is the beginning of new thinking.

Acknowledging that our existing capabilities such as people, resources, governance, systems and processes could be overwhelmed at all levels is the fundamental shift that enables our thinking and planning to translate into action.

It is pleasing to note that nationally, work is progressing on the implementation of the Capability Roadmap: Enhancing Emergency Management in Australia 2016. This will require a collaborative effort by the disaster management community.

FEMA's former head, Craig Fugate, recently reminded us that emergency services and governments cannot do it all on their own. To be more effective and reach those most vulnerable before, during and after a disaster, we must look to businesses, NGOs and philanthropic individuals for assistance.

Collectively, we must not lose sight of the first responders and the community and view them as a resource, not as victims or a problem.

In the recent flooding associated with Hurricane Harvey in the US, the scale of the disaster was unprecedented and overwhelming. As part of the response effort, FEMA sent out a call to action to the community to respond and assist in rescues. Communities responded from near and far, confirming that disaster response and recovery is a joint responsibility and involves everyone.

This issue of the AJEM focuses on the value of strong partnerships and an understanding of public policy to support action in disaster resilience. It is an area in which we are adept and where we must continue to adapt and evolve.

I hope that you enjoy this edition of the AJEM and I wish you and your colleagues a safe summer.

**Joe Buffone PSM**

Director Planning and Engagement
Crisis Coordination Branch
Emergency Management Australia

# Warm and dry lead up to fire season

David Bruce, Bushfire and Natural Hazards CRC

Most of Australia experienced autumn and winter conditions drier and warmer than average this year. In southern Australia in particular, the four months from May to August 2017 saw record dry conditions.

When the Bushfire and Natural Hazards CRC gathered scientists from the Bureau of Meteorology and fire and land management agencies around the country for a workshop in mid-August the early indications were for warm and dry conditions to continue.

This added up to an early and active fire season for much of southern Australia in 2017, according to the Southern Australia Seasonal Bushfire Outlook, released in early September.

The Bushfire and Natural Hazards CRC has brought these collective resources together for 10 years to produce the Outlook. The Outlook provides information to assist fire authorities in making strategic resource and planning decisions leading up to the fire season.

CEO of the Bushfire and Natural Hazards CRC, Dr Richard Thornton, said the annual southern and northern Outlooks were invaluable guides for community information in the lead-up to bushfire seasons.

'Although much of southern Australia has the potential for above-normal fire conditions, it must be remembered that even normal fire conditions will produce fires. Australia is a land of fire and everyone needs to be prepared; from the farmer on the land, to people in the urban fringes of our towns and cities.

'Our research is consistently showing that many Australians, especially those in high-risk areas, are not sufficiently ready for fire and have not put fire plans in place well ahead of time. They understand that when the conditions are right, hot and windy days with dry vegetation, fires will occur. But they just don't think it will happen to them,' said Dr Thornton.

The annual Southern Australia Bushfire Outlook is combined with the Northern Australia Bushfire Outlook, which was released in July following a similar gathering of fire and weather authorities for northern Australia at a workshop in Kununurra, Western Australia.

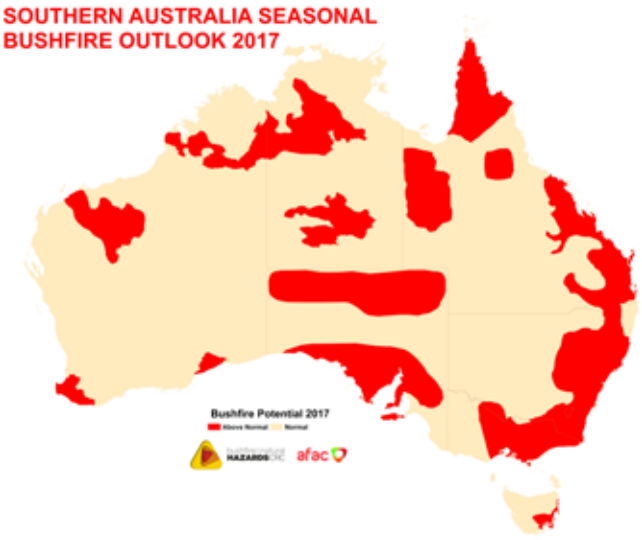
In determining the fire season potential across Australia, several factors are taken into account. The amount, location and timing of rainfall in the period leading up to the fire season are critically important for estimating fuel loads and dryness. The temperature and rainfall outlooks for the next few months are crucial factors for influencing the development of fire threat.

Of particular importance are the future tendencies of sea surface temperatures in the Pacific Ocean, associated with the *El Niño* Southern Oscillation, and those in the Indian Ocean. These are major drivers of climate over much of Australia.

Other factors considered include the distribution of firefighting resources to meet potential threats, as well as previous fire activity and the amount of prescribed burning that can reduce the threat.

The Outlook workshop participants discussed the weather, landscape conditions and cross-border implications leading into the fire seasons. In addition, areas where that had the potential for a fire season that was above normal, normal or below normal were determined.

The full Southern Australia Bushfire Seasonal Outlook is available at: www.bnhcrc.com.au/hazardnotes/38.




The Outlook provides information for fire authorities and planners.

Image: Bushfire and Natural Hazards CRC

# New approaches to response, recovery and resilience

Craig Fugate, Senior Advisor, Cadmus Group and Former Administrator of the US Federal Emergency Management Agency

As emergency managers, we plan for the unexpected. That's what we do. But when we look at the world around us—no matter what country—we see that we are not making our lives any easier.

We need to understand the difference between a *hazard* and a *disaster*. In July 2017, Alaska experienced a 7.7 magnitude earthquake that was a natural *hazard* but it was not a *disaster*. Why? Simply put, the very low population density in the hazard area meant that the earthquake had very little impact on people or property.

Contrast that with Hurricane Harvey and even the heavy rains in Louisiana in 2016. These hazards resulted in significant disasters because they affected the built environment and vulnerable populations.

Our task is not getting any easier. As we keep building, our populations become more vulnerable. We're seeing more sprawl in our communities, which means more people are living on the wildland interface, increasing their risks to wildfire. With increased urbanisation also comes increased dependence on technology and, consequently, less self-sufficiency for populations. In too many cases, where building codes are lax, increased urbanisation means an increase in the number of non-sustainable structures being built in hazardous areas. The just-in-time, interdependent supply chains that make our lives so much easier on a day-to-day basis means we will often have less resources on hand in times of need.

Craig Fugate discusses preparedness and disaster response, particularly when engaging the public.

Image: FEMA

So, what can we do? Here's my suggestion. As things change, we change along with them.

As part of embracing change, we must be sure to plan for what can happen, rather than what has happened in the past. We must bring science and analysis into our plans. Since we do not yet understand all the challenges that are being created by our expanding population, increased urbanisation and interdependent supply chains, we must look at our models to ensure that we are analysing the right things.

Furthermore, we need to think with vision regarding what is the worst that can happen. At FEMA, I challenged my staff to examine how they would respond to the 'maximum of maximums' challenge; the worst requirements and conditions that they might encounter across a range of scenarios. My intention was not to argue for more resources, because we never have enough. Rather, it was to analyse and understand what we have to do when we are stretched beyond our physical and even cognitive resources; how we are going to manage when we confront a real catastrophe?

We must have a far greater focus on three areas in particular, the whole community, public-private partnerships and incentivising mitigation.

## Whole community

A community is a collective. It's an understanding, organisation and strengthening of all community assets, capabilities and interests. The public is one of our greatest resources during a response. In many cases—and in all catastrophes—the first responder is likely to be a neighbour.

Your community should always be included in your plan. You do that by first building the public's trust and maintaining public confidence. Start by communicating, being honest and transparent, quickly and completely.

Let the public know what you're doing while you're doing it. And, let them know what you expect of them, too. Be realistic. This will enhance trust and confidence.

Next, consider the perception of the community as 'survivors' and not 'victims'. Yes, there will always be victims of disaster. But the ones who make it through should not be called victims; we should be calling them survivors and these survivors should be part of the team.

## Public-private partnerships

There are things the government does well during a response and things it does not do well. Ascertain which is which, and plan accordingly. Specifically, with regard to delivering needed services, the private sector is often far better equipped than the government. We want to work together with the private sector as a team, in a public-private partnership.

For example, historically, the amount of food and water the US government ships in does not meet the demand. Private businesses including grocery stores, fast food restaurants and similar are far more effective at providing amenities for entire cities. Consider putting a higher priority on getting the private sector up and running after a disaster. If these businesses get up and running, it takes tremendous stress off government resources.

Consider all areas of the private sector in your planning, not just big box stores. In the state of Florida, one of our best resources was a local veterinarian who helped us design protocols for how to incorporate pets into shelters.

Workers at FEMA's logistics centre in Fort Worth, Texas prepare food and water supplies to send to Hurricane Harvey survivors.

Image: FEMA

AIDR hosted Craig Fugate in Brisbane, Canberra and Melbourne in August 2017. For more insights from Craig, see page 8.

## Incentivising mitigation

A final element that will dramatically mitigate the effects of a hazard is the enhancement of building codes and a smarter approach to our built environment. We cannot expect old building codes to be sufficient when events are getting worse, and more frequent. We need to be building homes to better meet the risks faced. For families building their homes on the wildland interface, this means building with materials that are resistant to fires and keeping a safe distance of fuel from the house. This might mean an inconvenience of having to walk further to get to the woodpile but those extra steps might mean the difference between a house that stands and a house that burns.

Not everyone will like these ideas as they cost more money. So, if you meet resistance, provide incentives. This will make a dramatic difference in the result of the event. The reality is, if you do nothing, the response will cost far more money than updating codes and buildings.

## Conclusion

As emergency managers, we tend to plan and exercise for what we are capable of handling and hope we can scale up. This is a recipe for failure. We cannot just 'scale up'.

With the understanding that things are changing, it becomes increasingly critical to plan for the maximum predicted impacts of a disaster. Don't try to make data models fit your capabilities or disregard results you think are unlikely. Expect the worst.

By doing this (not making the disaster fit your capabilities) it forces the team to look at alternatives; to think differently. More importantly, it forces the team to look for solutions that are not merely scaling up current systems or practices, it forces the team to change its way of thinking to accommodate changing threats.

That is the ultimate goal, and that approach will save the most lives.

### About the author

Craig Fugate is the Senior Advisor to the CEO at The Cadmus Group, Inc. Previously, he served as the Administrator of the US Federal Emergency Management Agency to January 2017. In 2016, he received the National Emergency Management Association Lacy E. Suiter Award for lifetime achievements and contributions in the field of emergency management. Craig was the State of Florida's emergency management director from 2001 to 2009.

# A conversation with Craig Fugate: the importance of asking the right questions

Jacqui Douglas, Australian Institute for Disaster Resilience

Former US FEMA administrator Craig Fugate recently shared insights from his career with practitioners and policymakers in Brisbane, Canberra and Melbourne, hosted by AIDR. In sessions delivered with compelling narrative and passionate advocacy, the discussion repeatedly wound its way back to the point of 'so what': the need to work backwards from an outcome to ask the right questions, and prioritise information from 'noise.'

In the American vernacular, the 'so what' test is a blunt means of challenging the relevance or value of any piece of information. 'So what' is effective because it is outcomes-oriented. 'So what' asks what anyone would do differently, based on the information or the response to a question being asked. How will it affect the outcome?

Craig Fugate asserts that emergency managers must start from exercising worst-case scenarios; what he termed the 'maximum of maximums'. During his tenure at FEMA he exercised emergency scenarios to the potential extremes that can be caused by environmental hazards, no matter how horrific, using available science and calibrated data to dictate these scenarios. Confronting the worst that could happen allows us to understand what further demands need to be met under catastrophic circumstances (the 'demand signal') and highlights the inevitable government shortfall—whether or not it makes us uncomfortable.

Identifying the gap between government response capacity and the projected demand signal highlights the need to operate differently in the chaos of a disaster, rather than relying on a hypothetical scale-up of business-as-usual systems.

Working back from this starting point, Craig urged his audiences to ask the right questions to leverage the strengths of both community and the private sector, to shrink the gap between capacity and demand. Many may be familiar with his Waffle House Index—measuring the severity of a disaster by the rate at which a local fast food outlet can get up and running. Recognising that supermarkets can meet many community needs more efficiently than government aid, Craig shifted the emphasis to asking local essential businesses: 'what can I do to get you open?' Asking the right question revealed a need to remove traditional logistical or regulatory barriers, enabling business to do what they do best.

Asking the right questions is also imperative to efficient community planning. In a criticism of the concept of 'vulnerable groups,' Craig emphasised that communities are 'defined by people, not by us.' Calling for more inclusive planning, he argued that the dichotomy of vulnerability emerges out of planning that fails to reflect the communities as they are. Deeper knowledge of the community and its risk profile, with a view to the worst-case scenario, is vital in breaking the cycle of 'discovery learning' in emergency management. In this, he drew attention to the increasing volatility of natural hazards in the context of climate change; that the 'old ways of doing business work
well—for the old business!'

Adopting a 'so what' approach also supports more effective outcomes in times of crisis, where 'speed is the most precious commodity'. Prepared with a 'good foundation of what the community was like one minute before disaster struck,' Craig Fugate posits, we can stabilise a situation faster, again through asking the right questions: 'what has changed? what are you going to do differently?'

Ultimately, our ability to come up with the right questions relies not on an elusive creativity, but an evidence-based end point to work back from. In Craig Fugate's words: 'unless we have defined the outcome, I'm not sure we know what questions to ask...questions [that] lead to things that actually change that outcome.'

# Australian support for international disasters

Alan Goodwin, National Resource Sharing Centre

In 2017, the province of British Columbia in Canada experienced its worst fire season in history. More than one million hectares were burnt, across hundreds of fires. The state of emergency originally declared on 7 July 2017 was extended three times.

Australia has a long history of international firefighter deployment to both the United States and Canada. In the last 12 months, Australia has modernised and reviewed its agreements for assistance with both countries. This year has been the first time the international deployment process has been managed by the National Resource Sharing Centre (NRSC).

The process for this response is managed between the NRSC, AFAC and its Commissioners and Chief Officers Strategic Committee with support from the fire and emergency service agencies. For the Canadian deployment, both Emergency Management Victoria (EMV) and the NSW Rural Fire Service (NSW RFS) have become coordinating agencies. EMV coordinate the southern states of Victoria, South Australia, Tasmania and Western Australia and NSW RFS coordinate NSW, the Northern Territory, ACT and Queensland.

The NRSC oversees the process, liaising with deployment leaders in Winnipeg at the Canadian Interagency Forest Fire Centre (CIFFC). The NRSC embeds an Australian liaison at that office who organises the quantities of personnel needed and the skills and qualifications that are required. After receiving that information and agreeing on the arrangements required, the NRSC relies on the two coordinating agencies in NSW and Victoria to arrange the firefighters, get them prepared and get them to Sydney to depart for their deployment. The NRSC arranges the firefighters' travel to Canada, monitors the work they're doing, and investigates what further needs Australia can offer.

Australia can support the Canadians with appropriate personnel because of our similarities in a range of areas. Like Canada and the U.S., Australia operates in similar ways under an incident command system, the Australasian Inter-service Incident Management System. This allows the Australian firefighters to 'fit' straight in to the Canadian fire operations. Like-for-like, an operations officer in Australia is equivalent to an operations officer in Canada. Where there have been differences in practices and terminology, the NSRC and CIFFC are able to address these through orientations or other briefings.

The value of an international deployment is significant first and foremost to those who are being assisted. The Canadians only ask for help when they need to supplement their fire management specialists. For Australian land and fire and emergency services agencies, it is an opportune way to add value in a short timeframe.

Individual firefighters also benefit greatly, both personally and professionally. The opportunity for a firefighter to go overseas, apply their skills and knowledge, and enhance that knowledge and experience by working with different people and systems is a strong part of why so many men and women undertake an international deployment. Most adapt well and soak up that learning. When they come back to Australia they have a broader base to draw on and help them at home in their firefighting.

Domestic agencies that send personnel also benefit from the leadership skills and the different ways of thinking that their staff bring back. The flow on effects are strong in terms of leadership, experience, personal growth, knowledge and understanding.

A core consideration for agencies that deploy personnel is their own operational requirements. For example, a land management agency like Parks and Wildlife NSW or the NSW RFS have a spring burning program before the main fire season. To ensure there are enough staff based locally and that returning staff aren't tired and stressed when they return from deployments, timing and a shared approach is critical. Every state and territory has participated in sending personnel to Canada this summer. The capability and capacity of all agencies is relied on to spread the load between assisting our international counterparts and responding to domestic emergencies.

This is the first disaster where Australia has deployed international firefighters through the NRSC. On a national scale, we enhance the skills of our people, forge international partnerships that progress into training, research and management and assist our international allies in their time of need. There is a substantial logistical operation to get 230 people together, transport them to Canada, keep them working, keep them safe and bring them home. This national capability shows what we can do quickly for aid into the future; domestically and globally.

# Priorities to guide hazards research

David Bruce, Bushfire and Natural Hazards CRC

The most significant natural hazard emergency management issues Australia faces have been drawn up by leaders from the sector to guide research over the next decade.

A set of priorities for national research into natural hazards was launched by the Bushfire and Natural Hazards CRC in July and is now online for broader discussion. The priorities arose out of a series of national workshops with the emergency management sector that led to consideration by the Australia-New Zealand Emergency Management Committee.

This is the first time such a future-thinking exercise has been undertaken on natural hazards research in Australia. With the economic costs of disasters in Australia expected to increase from $9 billion to $33 billion per annum by 2050, Bushfire and Natural Hazards CRC CEO Dr Richard Thornton believes that the difficult and complex questions must be asked.

'As a nation, we have a moral and economic obligation to mitigate against the impact of natural hazards,' Dr Thornton said.

'As members of the emergency management sector, we have a responsibility to identify the major issues that need to be addressed to build safer and more resilient communities.

'As members of the research community, we have a responsibility to apply our skills, knowledge and creativity to identify potential solutions and bring them to fruition,' he said.

The CRC steered the process that began with a review of its entire research agenda in late 2016.

'We did this to help people understand that if they are spending research money or commissioning research then they can look at the priorities that the whole sector has indicated are important. That allows us to work together to solve some of those issues rather than have competitive approaches,' he said.

The CRC will promote these priorities and discuss their potential with funding groups such as the Australian Research Council and National Health and Medical Research Council.

'One thing we did was go out to the emergency management sector and come up with a list of the things that are critical from a research perspective. We did that by sitting down with about 16 different groups at workshops all around the country covering everything from mitigation, diversity, warnings and volunteering, through to the mechanic, physics and meteorology of hazards, right through to recovery, picking up important contributors like insurance, urban planning and urban operations.

'We took a broad, whole-of-sector approach to come up with a set of research questions that spelled out the most significant natural hazard emergency management issues Australia faces over the next decade,' Dr Thornton said.

There were four key drivers that consistantly came across at the workshops, being:

- shared responsibility and community engagement
- communicating risk and understanding the benefits of mitigation
- climate change
- predicting hazards more accurately, leading to better warnings.

'Shared responsibility and community engagement considers how governments help communities manage and understand their own risk. How can governments collaborate effectively with communities to break down silos and build trust?

Reducing fire hazard with a presecribed burn on the coast of Tasmania.

Image: David Bruce

The economics of mitigation are difficult to understand until a natural hazard actually happens.

Image: Dana Fairhead

'Risk communication and understanding the benefits of mitigation arises as agencies and governments often struggle with how to communicate risk in a way that is personalised for the community and the individual.

'The CRC has done post-event analysis and one of the constant refrains we hear from the public is "we knew this was a risky area to live in, but we didn't believe it was a risk for us". It's always going to be a risk for somebody else. So we need to find ways to get beyond that.

'We also found that it is difficult to understand the economics that underpin the benefits of mitigation. We know that to avoid an event is instinctively better than to have to recover from it, but it's actually a hard economic discussion to have with treasuries of all levels of government. It means investing today in something that might not happen for 50 years or more. And you are counting saves and not impacts.

'The third major area was the impact of climate change and how it will alter the hazard profiles across Australia. What mitigation should we be doing today and how do we consider potential increases in hazards from climate change? How do we incorporate future climates into operational decisions that includes cumulative disasters where hazards become more prevalent, such as two major flood events one after the other?

'And finally, how do we do better warnings; better weather forecasts, flood forecasts, cyclone prediction and fire prediction. How do we communicate these in ways that are effective as warnings?' he said.

A national discussion within the emergency management sector has identified themes for research priorities, but this is not intended as a final nor comprehensive list. As new themes and research priorities are identified in coming years, they will be included and published on the CRC website.

The CRC has developed a suite of three publications on national research priorities:

1. National research priorities for natural hazards emergency management - issues, priorities, directions.
2. A summary of workshop outputs supporting the statement on national research priorities for natural hazards emergency management.
3. A series of information guides for future research activities, individually themed around a workshop topic.

'We can now say, "Here's a set of priorities agreed to by the sector. If you want to work on something that's going to make a difference to community safety and to disaster resilience, then here is a set of shared priorities that sets out some of the big questions that you might want to consider",' said Dr Thornton.

The national research priorities for natural hazards emergency management are at www.bnhcrc.com.au/nationalpriorities.

# Maintaining communication during relief and recovery efforts: the ADF public affairs capability

Fiona Bickerstaff, Australian Defence Force

During an emergency, information can mean the difference between life and death. Emergency broadcasts that issue evacuation orders, warnings and information that help to prepare and protect the public have primacy in an unfolding situation.

Once the immediate threat to life and property passes though, the imperative to keep the public informed of details surrounding ongoing rescue, relief and recovery efforts remains. When involved in the response and recovery effort, the Australian Defence Force (ADF) maintains its information activities and responsibilities through its dedicated Military Public Affairs assets.

The ADF is often called on by state and territory governments to provide emergency support in times of natural disaster or civil emergency, known as a DACC task – defence assistance to the civil community.

Once this request for support is made, the ADF will rapidly deploy personnel and equipment needed to provide the support that the civilian emergency services require.

Just as every agency plays its part in emergency response, each agency has a responsibility to communicate its response to the public. This ensures those immediately affected stay informed to ensure that broader public safety and timely and accurate information is circulated through the right communications channels.

Image: Australian Defence Force

Image: Australian Defence Force

To achieve this, the ADF deploys Military Public Affairs assets as part of its emergency support commitment, either individually or as a capability brick known as a Military Camera Team. These assets are primarily drawn from its 1st Joint Public Affairs Unit (1JPAU).

1JPAU is a tri-service force element focused on fulfilling the Australian Government's public information remit when it comes to defence and dedicated to informing the Australian public of the work of the ADF.

Typically, a Military Camera Team comprises a still photographer or Imagery Specialist, a videographer or Senior Imagery Specialist and a Team Leader, who provides the overall communications intent and administrative functions for the team as a whole.

Each member of the team is a highly skilled photographer, videographer or communications practitioner and also well-trained and highly capable members of the ADF, be it soldier, sailor or airman.

What makes this capability unique in an emergency response situation is the access that this combination of skills provides. The emergency response information space will invariably be well-serviced by designated state and local-level spokespeople, emergency service agencies communications staff, the media and indeed information from civilian eyewitnesses or 'citizen journalists'.

Military Public Affairs personnel are able to provide an 'up close and personal' view of some of the relief or recovery efforts that ADF elements provide by embedding with these elements as they go about their work.

Each member is trained to navigate the hazards on the ground, have a keen understanding of the news cycle to provide timely and accurate information and the right equipment to ensure that still and video imagery is of the highest quality possible, easy to edit and ready to broadcast.

Military Public Affairs personnel help fill the 'information gap' that the media and other communications elements are unable to bridge, either due to physical obstruction or isolation, dislocation or ongoing threats or hazards in the area.

Additionally, a Military Public Affairs Officer or Team Leader assists as an information conduit to the chain of command, civilian emergency response partners and any military liaison officers embedded within Emergency Coordination Centres, making sure information flows through all channels and reaches the public via the right agency.

Natural disasters and civil emergencies present a complex and dynamic information environment and as the stakeholders grow, messages can be diluted and disinformation can take hold. Military Public Affairs personnel ensure that assistance to civilian emergency service partners remains at the heart of messaging so that Australians know that regardless of the emergency, the ADF is here to lend a helping hand.


Image: Australian Defence Force

# Country Fire Authority establishes an evidence base to guide future leadership development

Dr Christine Owen, University of Tasmania and Fiona Martin, Country Fire Authority

The Country Fire Authority (Victoria) evidence-based foundation and framework for leadership targets leadership development needs and opportunities for personnel engaged in incident management and those engaged in business-as-usual activities.

The term 'capabilities' has been adopted from other leadership capability frameworks, such as the AFAC Emergency Management Professionalisation Scheme (EMPS) and the Red Cross Leadership Capability Framework. In these frameworks capabilities are an indication from an organisation to its workforce of the expected areas and levels of performance. Capabilities describe 'how' people work as opposed to 'what' they need to do. Capabilities refer to people capabilities and are distinguished from system, procedural or organisational capabilities.

The CFA recognises that previous ways of gaining experience are not likely to be sustainable into the future. The typical way that existing senior personnel developed their expertise is no longer an option for newcomers for two reasons. First, the cohort of existing incident managers is ageing. Less experienced personnel will not have the luxury of building their capability through experience over decades. Personnel are likely to be thrust into leadership positions sooner than their more experienced counterparts due to the anticipated attrition as the existing leadership cohort reach retirement age. Second, incidents are likely to be faced that are more complex than in the past. This is because incidents can escalate faster, require more diverse stakeholder inputs and have longer-term consequence management considerations.

Personnel and agencies are under increasing scrutiny, requiring all components of emergency management and agency business to articulate the evidence base for existing practice. In addition, government budget cuts require all personnel to do more with less. An incident management leadership development learning system needs to be agile and also efficient.

The CFA takes the idea of leadership outlined by the Australian Public Service Commission:

- Leadership is a practice; something a person *does*. It isn't about seniority or particular personality traits. Therefore anyone, at any level, can exercise leadership.
- *Mobilising* people to thrive; motivating, organising or inspiring others to do something useful or beneficial for the collective good. It isn't about getting people to do what you want.
- Making progress on challenges involves change; changing existing ways of doing things, existing behaviours and assumptions and determining what should remain the same.
- Leadership is something a person chooses to do sometimes when faced with challenges; particularly when a shift is required in behaviours, beliefs or values.

The work of the CFA takes an important step forward and will be of interest to other agencies and jurisdictions.

For information contact Fiona Martin at CFA: F.Martin@cfa.vic.gov.au.

# Exercise *Exchange Student*: student skills on fire

Susan Davie, Victoria State Emergency Service and Ian Morrison, Thinkspace Emergency Management

In July 2017, 25 Year 10 students from the Macedon Ranges in Victoria traded their school uniforms for State Control Centre tabards to put their emergency skills to the test.

Students from Braemar College, Kyneton Secondary College, Gisborne Secondary College and Sacred Heart College took part in the exercise. They worked on a fire scenario loosely based on the Ash Wednesday bushfires of 1983, which would affect them all if it occurred today.

Exercise *Student Exchange* was developed in a partnership between the Victoria SES, Macedon Ranges Shire Council and Emergency Management Victoria with Thinkspace Emergency Management. The exercise explored and validated existing emergency management plans in relation to the needs of children and young people in emergency settings.


Students received briefings from the team leader during the *Exchange Student* exercise.

Image: Matt Gallant, VICSES

This builds on work undertaken in 2012 when the Macedon Ranges Shire Council Youth Development Unit and Emergency Management Unit hosted a Youth Emergency Management Workshop.[1] Young people from across the municipality came together to identify and discuss emergency management issues in areas that concern young people.

The purpose of the 2012 workshop was to establish a link between young people living in the shire and the emergency management planning process. The Municipal Emergency Management Planning Committee (MEMPC) endorsed the workshop as a way to consult with young people regarding the local emergency management plan.

Following this workshop, the MEMPC created the Children and Young People Emergency Sub-Committee. The sub-committee developed the Children and Young People Emergency Sub-plan, as part of the Municipal Emergency Management Plan. The *Emergency Management Manual of Victoria* recognises children as being uniquely vulnerable during emergencies. Similarly, the Victorian Government *Emergency Management Planning Guide for Children and Young People 2012* advises best practice must:

- include children and young people in emergency plans
- engage child and youth experts to update and review emergency management plans
- engage young people in the emergency management planning process.

The goals of the exercise were to:

- increase the number of young people represented on the youth subcommittee of the Macedon Ranges Municipal Emergency Management Planning Committee and their levels of awareness
- increase the capacity for young people to contribute to relief and recovery activities in the Macedon Ranges

1 Hocking A, Taylor B & Tupek K 2012, Macedon Ranges youth experiences in emergency management planning, Australian Journal of Emergency Management, vol. 29 no. 1, pp 56-58.

Students were able to role-play media briefings in the State Control Centre.

Image: Matt Gallant, VICSES

- develop the capacity of young leaders in the Macedon Ranges to participate in decision-making
- demonstrate an emergency management career pathway for young people.

Participants were divided into two teams and mentored by emergency management professionals from a variety of Victorian Government departments and emergency management agencies.

During the exercise, participants focused on the situation, mission and execution of delivering community information. Both teams successfully completed a filmed piece to camera encouraging community members to:

- know what to do in the event of an emergency
- make it a habit to check the Fire Danger Rating every day during summer
- leave early during emergencies if it is safe to do so.

The exercise concluded with participants briefing the Emergency Management Commissioner, Craig Lapsley and Mary-Anne Thomas MP, Member for Macedon regarding recommended state-wide priorities for responding to a major fire scenario with Code Red Fire Danger.

Participant feedback showed there was significant value from learning how emergency services deal with situations and work together. Participants had the opportunity to:

- analyse core problems and issues in an emergency management context
- establish whether challenges were adequately dealt with through emergency response arrangements
- decide how existing emergency management arrangements could be adapted in response to challenges particularly relating to the needs of children and young people.

Craig Lapsley said students demonstrated an excellent understanding and awareness of bushfire.

'Living in the Macedon Ranges, these students have a great understanding of fire and how fire can affect people and communities. Young people have a lot to contribute in their community and in emergency management. It's important their voices are heard,' he said.

Students with Craig Lapsley Emergency Management Commissioner and Mary-Anne Thomas MP, Member for Macedon.

Image: Matt Gallant, VICSES

# Building an animal-ready community: a community-led initiative to improve preparedness, planning and safety for animals and their owners

Dr Mel Taylor and Dr Megan McCarthy, Macquarie University and Bushfire & Natural Hazards CRC and Jenny Bigelow, Blue ARC: Animal Ready Community.

In Australia, 62 per cent of households have pets, which presents opportunities for activities that incorporate planning and response for pets and animals during times of emergency and in the recovery stages that follow.

Animals provide an avenue to connect communities. This offers a subject to engage community members to work together in emergency preparedness and planning. In Australia, 62 per cent of householders own pets and the majority consider them to be family members.[1] In addition, many households also have other non-pet animals, with which they have special bonds and will be motivated to protect and save in an emergency, such as horses, pet livestock and chickens.

The Managing Animals in Disasters (MAiD) project is part of the Bushfire and Natural Hazard CRC research program to identify best-practice approaches to animal emergency management (AEM). The goal is to increase public and responder safety and improve animal welfare. As part of this research the MAiD project teamed up with a new community-led group based in the NSW Blue Mountains called Blue ARC: Animal Ready Community.

Community involvement in the creation of 'animal-ready communities' has been formalised for a number of years in the United States through Community Animal Response Teams (CART). CARTs comprise volunteers who are trained to respond in any emergency in their local community and enhance health and safety for humans and animals. In Australia, there is no equivalent initiative. Therefore, observing and supporting the Blue ARC group provides an opportunity to learn from the group start-up process, to be part of the development of various community-focused initiatives and to evaluate these outputs. The purpose of this partnership, beyond supporting the Blue Mountains community in AEM, is to distil and translate learnings into a generic guide for communities wanting to develop a similar community led group. This resource will be freely available and it is expected to comprise a brief 'How to' guide and an accompanying resource pack.

The guide can be used to promote emergency preparedness and planning through a focus on animals. It will include advice on group formation, agreement on group aims and objectives, identify challenges and potential opportunities and identify a range of activities that could be customised for different communities, and across hazards; many tried and tested by the Blue ARC group. The resource pack will include materials developed as part of the current work with Blue ARC, including a question bank for surveys, templates for posters and fact sheets and plans for low-cost community training.

Content for the guide and resource pack is evolving as the MAiD team and Blue ARC group roll-out its activities. It is anticipated that the first draft of these resources will be available in 2018, once the current set of activities has been completed and evaluated. The guide and resource pack is likely to evolve and expand as the activities of Blue ARC increase and evaluation outcomes are known.[2]

1 Animal Medicines Australia 2016, Pet Ownership in Australia 2016. At: www.animalmedicinesaustralia.org.au/wp-content/uploads/2016/11/AMA_Pet-Ownership-in-Australia-2016-Report_*sml.pdf*.

2 Bushfire and Natural Hazards CRC 2017, Community taking lead in emergency planning for their animals. Hazard Note. Issue 35: June 2017.

Image: Jenny Bigelow, Blue ARC

## The October 2013 Blue Mountains bushfire and pets

The Blue Mountains area is regarded as the most bushfire-prone area in NSW. In October 2013, the area experienced its worst bushfires in over 30 years. Three fires burnt for four weeks, burning over 118,000 hectares of land and destroying 203 homes. Research following these bushfires identified the impact pets and other animals had on owner behaviour.[3] Many pets and other animals died in these fires. Although no official record of pet deaths was compiled, the longer-term effect has been recognised by groups and community members assisting with recovery including the Salvation Army, Red Cross, school teachers and counsellors.

## Formation of Blue ARC

Shortly after the October 2013 bushfire, a group of community members produced a book about recovery after the fires. This book 'As the Smoke Clears' contained photographs of recovery of fauna and flora and was sold to raise money for the Blue Mountains Mayoral Bushfire Relief Fund. Many of these group members went on to form the Blue ARC group. This group received funding back from the Mayoral Bushfire Relief Fund and is auspiced by Springwood Neighbourhood Centre Co-operative Ltd. The group was formed in September 2015.

### Blue ARC rationale and approach

Blue ARC's central goal is to support community resilience in emergency events through better awareness, preparedness, planning and response for companion animals, livestock and wildlife. To achieve this, the main activities of Blue ARC have been to:

- identify and pursue ways to increase community awareness of animals in emergency planning
- engage with emergency services and supporting agencies to address barriers to preparedness and planning including animals
- support formal response and recovery organisations in responding better to the needs of animal owners and animals.

Importantly, Blue ARC works with formal response agencies, supporting their general messages and promoting their materials, as well as networking widely with local animal groups (e.g. societies and associations) to produce locally relevant outputs. These activities strengthen and reinforce official advice while assisting the community with tailored and locally relevant support.

### Identifying needs and potential solutions

Before developing materials, it was important to establish the needs of the community and of responders; their barriers and challenge, and the information and resources needed. Four activities have been undertaken, and are at varying stages of completion.

**Community survey** – more than 300 residents have completed an online survey about their preparedness and planning for their animals, their needs, their expectations and their interests in training and education in this area. This information is being analysed and used to prioritise activities and development of support materials as well as present to, and ask questions of, various response and recovery agencies and local groups.


3 Wilkinson C, Eriksen C & Penman T 2016, *Into the firing line: Civilian ingress during the 2013 Red October bushfires, Australia. Natural Hazards, vol. 80, no. 1, pp.* 521-538.

**Audit of local veterinary services** – one of the early findings from the survey was the importance placed on local veterinarians as sources of information and assistance with animals in an emergency event. Given the special role of veterinarians, local veterinary practices were surveyed to identify specialist services offered, perceptions of their role during emergencies, their needs (training, resources) and the previous support given to the community in the 2013 fire.

**Interviews with key stakeholders** – interviews are being undertaken with key agencies, local groups and organisations to understand what has been done in past events for animals, their owners and for wildlife and to address the various needs of community, identified from the survey. This work is ongoing and will inform other outputs.

**Developing low-cost community training** – we are working with a local veterinarian to develop short community workshops and YouTube video resources based on community needs and interest in basic information and skills training . This activity is in its early stages but will include pet first aid training, basic animal and wildlife handling skills and emergency preparedness for animals.

## Raising awareness and engaging the community

To raise awareness, the Blue ARC group is involved in four activities:

**School art competition** – as a pilot activity, an art competition challenged children at Winmalee Public School to draw or paint their favourite animal and to say why that animal is important to them. Although this activity is not bushfire-specific, it is focused on why animals matter to children and (indirectly) why they need to be considered during emergencies. Over 322 entries were judged and winners selected in September 2017. All entries will be compiled into a book for sale at the school's Grandparents' Day. Due to local interest, this activity will be expanded to other schools in the region in 2018, with an emergency preparedness theme.


**Animal preparedness factsheets** (Chickens) – a set of species-specific factsheets will support animal owners to plan and prepare for their animals. These will include animal-preparedness information and locally specific information e.g. local association contacts and specialist veterinary care. As chicken ownership is prevalent in the Blue Mountains and survey results suggest that chickens are poorly prepared for in emergencies, the first factsheet will be developed for chicken and poultry owners. This is being developed with the assistance of interest groups and a local vet.


**Emergency preparedness poster** – the community survey identified vulnerable populations, including multiple animal households and elderly residents who may be ill-prepared or had potentially unrealistic expectations of themselves and their ability to evacuate their pets in an emergency. To address this, Blue ARC teamed up with the Blue Mountains Resilience and Preparedness Group to produce an emergency preparedness poster showing a (positive) image of a well-prepared older person ready to evacuate with her dog and chicken. This poster is being displayed at council facilities, vet clinics, neighbourhood centres and other community locations with an accompanying flyer prepared with a list of links to resources produced by NSW RFS, NSW SES, NSW DPI and others, to assist with preparing for animals in emergencies.

**'Get Ready Weekend' activities** – Blue ARC and the Resilience and Preparedness Group will be involved in local NSW RFS bushfire preparedness activities by distributing emergency preparedness flyers, identifying potential animal carrier options and suppliers and promoting access to resources produced by NSW RFS, NSW DPI and other official sources as well as the database for local vet clinics and boarding options.

# EMPA conferences Sydney and New Zealand 2017

Vanessa Bartholomew

The power of story telling was a consistent thread throughout the Emergency Media and Public Affairs (EMPA) conferences, held in Sydney in June and in Wellington in August 2017.

Delegates at both conferences received an array of tips and ideas on crafting thoughtful messages for their communities during times of crisis.

In Sydney, the opening keynote from Melany Markham, currently in Mosul with the Norwegian Refugee Council, drew from a depth of experiences in frontline situations to talk about the taboos and restrictions of 'Telling Stories of Disaster'. She challenged the common practices of media-imposed censorship of difficult and traumatic stories.

Hope Hall was Barack Obama's personal videographer for the last six years of his presidency. Her talk on getting the tone right in storytelling was straight from her heart. Hope's website is worth checking out for inspiration www.hopehall.com.

Mark Crosweller, Director-General of Emergency Management Australia, spoke on ethics in emergency management. His presentation focused on empathy and compassion in communicating with affected communities.

This focus was reinforced by Dr Margaret Moreton's research on the disconnect between the expectations of communities in recovery and those of recovery authorities.

In a case study on how messages can go awry despite the best intentions, Anthony Clark, Director of Corporate Communications at NSW Rural Fire Service, described the experiences of community criticism after the recent Sir Ivan fires in NSW.

Research into warning messages was highlighted by several speakers including Associate Professor Amisha Mehta, a Bushfire and Natural Hazards CRC researcher at Queensland University of Technology. Her work is about getting the messaging right by trialling combinations and ordering of content with different audiences.

Steve Sutton, another Bushfire and Natural Hazards CRC researcher, based at Charles Darwin University, told an informative tale of how warnings based on long-held community and cultural understandings protected an Indonesian community from the worst impacts of tsunami.

Winner of the EMPA Media Coverage award, Chris Lynch, Newstalk ZB, with his award.

Image: Hope Hall


Wellington Mayor Justin Lester, addresses the delegates at the EMPA New Zealand conference.

Image: Hope Hall

Workshops were popular, with EMPA leading a session developing a model for the public information function in cross-jurisdictional deployments.

Mike Daniels of The Behaviour Architects also ran a mini-workshop on behavioural challenges during the main conference sessions. He tackled the plight of many community engagement workers who may successfully change attitudes but fail to change behaviour.

Rebecca Riggs of Highground Communication finished the event by collating all the knowledge shared and putting empathetic storytelling into practice.

The 10th annual EMPA Conference, held in Sydney on 4-6 June 2017, was attended by 80 crisis and emergency communicators from Australia and New Zealand. Themed 'Communicating to Influence Behaviour in Emergencies', the conference presented a combination of eclectic and practical presentations that provoked vigorous discussion and deep reflection in equal measure.

In August, EMPA crossed the Tasman to stage its 4th New Zealand conference in Wellington. It was attended by a record 150 delegates from police, fire and rescue, local and national government as well as aviation, insurance and primary industries.

EMPA in New Zealand featured keynote talks by Chris Webb, former head of media at Scotland Yard; Sarah Stuart-Black, Director of Civil Defence Emergency Management; Mayor Justin Lester, Wellington City Council and Rosemarie North, International Red Cross, Geneva.

EMPA also presented its inaugural New Zealand Awards for Excellence. In the four categories, the winners were:

- Emergency Communication: Kaikoura EOC PIM team
- Readiness and Resilience: Wellington Regional Emergency Management Office
- Readiness and Resilience: Emergency Management Bay of Plenty
- Media Coverage: Chris Lynch - Newstalk ZB
- Innovation in Public Communications: Brian FM

The next EMPA conferences are in Melbourne in June 2018 and Wellington in August 2018.

EMPA is the only organisation in the world for communications practitioners, media and researchers, focused on encouraging best practice in emergency communications.

The Sydney EMPA Conference was sponsored by Emergency Management Australia and NSW Rural Fire Service.

EMPA New Zealand was sponsored by Auckland Council, Ministry for Civil Defence and Emergency, Ministry of Health, Ministry for Primary Industries, New Zealand Police, Maritime New Zealand and Wellington City Council.

# AJEM peer review of research

Peer reviewers for the AJEM number just over 150 and represent 99 different institutions covering universities, government and non-government organisations, private practices and research institutions. Reviewers are predominately from Australia and New Zealand but the AJEM's growing international influence means we now have reviewers from Canada, Indonesia, Taiwan, United States, United Kingdom, Switzerland and Germany.

Every AJEM research paper completes a double-blind peer review process involving one and perhaps two rounds of review. Less 'academic' papers also complete a content peer review by a single reviewer. AJEM peer reviewers play a quintessential role in upholding the quality of AJEM published articles and the relevance of material for readers.

Some peer reviewers have been with the AJEM since its early days and have been pillars of expertise and great supporters as authors and reviewers. Over recent years, the changing nature of natural hazard occurrences, emergency and disaster management and the growing importance of all areas of resilience has meant AJEM peer reviewers come from a wider range of expertise. Now, new 'waves' of authors are turning to AJEM to publish their research.

The AJEM was first published in 1986 and, looking back at its 31 years of published research and information, the AJEM has positioned Australia as a very active hub of emergency management action with strong international links; such is the depth and breadth of subject matter and topics covered.

Visit the AJEM's new website and online catalogue at the Australian Disaster Resilience Knowledge Hub: www.knowledge.aidr.org.au/collections/australian-journal-of-emergency-management.

# Connecting cities: Sydney embraces 100 Resilient Cities

Jacqui Douglas, Australian Institute for Disaster Resilience

100 Resilient Cities, pioneered by the Rockefeller Foundation (100RC) is dedicated to helping cities around the world become more resilient to the physical, social and economic challenges that are a growing part of the 21st century.[1]

Since selection for 100RC in 2014, Sydney has been active in the development of its first resilience strategy with Chief Resilience Officer Beck Dawson at the helm. Between sessions at AFAC17, Beck Dawson shared insights with AIDR about the experience thus far and her vision for a more connected city.

In 2016, Resilient Sydney—a metropolitan collaboration of councils hosted by the City of Sydney—released its Preliminary Resilience Assessment. This was the first step in a three-phase process to implement a resilience strategy. Beck Dawson outlined the 100RC dichotomy of shocks and stresses; 'the acute things that would stop the city [and] those longer, slow-burning issues.' The published assessment outlines 'short-term disruptions' ranging from extreme weather to the failure of digital and infrastructure networks. Among the stresses are more complex, systemic issues such as transport diversity, housing affordability and social cohesion.[2]

In particular, the evidence demonstrates the importance of social cohesion; in Beck Dawson's words, 'the single biggest determinant for recovery of big cities.' She boils down the global experience of 100RC to the fundamental realisation that cities are 'for, by and made of people,' and asserts that interconnectedness within communities is a greater protective factor than financial resources or even forward-planning at the individual level. Social cohesion also emerged in public engagement work as a key community priority, particularly given the proliferation of dense, vertical communities in Sydney.

Other community priorities include governance and inclusive decision-making. Beck Dawson emphasises the depth of understanding within communities about the importance of resilience, as well as their knowledge of city connectedness relative to experts, influencers and city operators. In light of the global 100RC experience, she recognises the need to develop a robust governance model connecting the layers of government with community and business supports that provides a clearer picture of both risks and possible solutions.


Beck Dawson explains the 100 Resilient Cities progress.

Image: AIDR

Beck Dawson is eager to build on existing alignment of vision with Sydney's booming private sector, affirming the readiness of business players to understand and manage their risks going forward, and to assume a meaningful role in the city's resilience strategy. Again, a seat at the table is vital for the private sector contribution to a joined-up strategy.

For Sydney, the next steps reflect the need to work at both a community and city scale. At the local level, that means programs that support councils to better involve their communities. More broadly, Beck Dawson outlines opportunities for structural and strategic approaches to resilience, such as mapping escape routes in response to a range of different hazards.

Ultimately, the experience is one of global learning and local application. Beck Dawson urges honesty in appraising the reality of the shocks and stresses: 'We're not immune to those issues, they are real here too...let's have that frank discussion. We'll all be better prepared as a result,' she said.

1 100 Resilient Cities, About Us. At: http://100resilientcities.org/about-us/.

2 Resilient Sydney Preliminary Resilience Assessment 2016. At: www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0005/263975/2016-503932-Report-Resilient-Sydney-PRA-FINAL-ISSUED.pdf.

# Crisis Proofing: how to save your company from disaster

Reviewed by Amara Bains, Adjunct Fellow, University of Queensland


*Published by Oxford University Press 2016*

*ISBN: 9780190303365*

Crisis proofing requires leadership from the top and this book is devoted to that central idea. Tony Jaques succeeds in presenting an accessible guide to effective crisis prevention. His book provides numerous quotes from leaders (in or out of crisis) and practical examples of the good, the bad and the ugly in issue or crisis management.

Without oversimplifying the steps to successful issues management, Jaques writes for an audience with an assumed level of intelligence and capacity for reflection. His pragmatic style of writing generates a sense of 'cutting to the chase': a welcome relief as, too often, the desire to give the reader a 'potted history' of theoretical underpinnings ahead of the practical solutions ends up leaving readers bored.

While there may not be any major revelations in this book in terms of what is required to successfully prevent an organisation from experiencing a crisis, what it does do is highlight the pitfalls or misconceptions of implementing these approaches.

There are no punches pulled. Leaders are responsible for how their organisation emerges from a crisis and it all starts with leaving one's ego, 'bias towards optimism' and 'wilful blindness' at the door. In fact, Jaques quotes a management report that states mindful leaders are required to avert crisis: 'One of the most important things is having people around you who tell you how wrong you are'.

The book is not short on practical advice. In managing issues, Jaques's recommended method is to take lists of identified issues and the myriad of corresponding understandings and place them into a simple management model—the 'Do-it Plan'.

What seems like an obvious solution, those who have participated in countless planning meetings know that a practical plan is often the least likely outcome of such gatherings. In Jaques's book, his 'Do-it Plan' is based on a simple equation: Problem + Impact = Issue.

Using examples he illustrates how an issue can be oversimplified thereby potentially creating ambiguity and impeding the development of an operational plan. He explains that by adopting the equation, an issue can be accurately defined and communicated enabling a focus beyond the problem itself and on its relevance or importance to the organisation.

The book discusses the 'usual suspects' of crisis management, crisis management teams, communications and aligning strategic planning with issues management. But what sets this book apart is his focus on the task not on the tools. Central to this, he proposes, is the quality of leadership; 'While the facts and data are critically important, most issues and crises also revolve around human qualities and empathy'.

Jaques suggests that reliance on technical and legal skills to resolve crises can lead to ignoring or under-playing the ethical dimensions of a response to a crisis, often to an organisation's detriment. One tool increasingly more important in managing the human dimensions of a crisis is social media.

The last part of the book focuses on the role of social media in a crisis, especially the speed at which information is shared. Jaques explains that while controlling the flow of information may not be possible, controlling your message can be mastered.

Citing the example of the Boston Police Chief who live-tweeted his decisions following the bombing at the Boston Marathon, the author proclaimed that it was an action that highlighted '...the power of human-to-human communication and his strong emotional intelligence'.

He elaborates on the use of technology, such as dark websites, and, towards the end of the book, on addressing cross-border crises.

Jaques draws his book to a close by directing the reader back to his beginning premise, that addressing key aspects of leadership is required for successful navigation of a crisis. He reminds the reader of the data from the Institute for Crisis Management in Denver, Colorado that shows more than half of all corporate crises are caused by management; either management action or inaction. He concludes that the role of executive leadership in a crisis is to drive a learning orientation. The uncluttered explanations of key issue management concepts make this book a useful addition to the practitioner and non-practitioner alike.

# New handbooks for the Handbook Collection

Amanda Lamont, Australian Institute for Disaster Resilience

An updated Evacuation Planning Handbook and a new Communities Responding to Disasters: Planning for Spontaneous Volunteers handbook profile new nationally agreed principles for these areas. These Handbooks form part of the Australian Disaster Resilience Handbook Collection.

The current Handbook Collection, managed by AIDR, includes 16 handbooks, six that are currently under review or development. The handbooks provide an all-hazards national perspective, focusing on principles and guidance. They can be used to support anyone working in the disaster context in developing policies and plans, including emergency management practitioners, government and community groups.

The new Communities Responding to Disasters: Planning for Spontaneous Volunteers Handbook explores spontaneous volunteering in an emergency context. It provides guidance to those working with spontaneous volunteers about how to harness this capability and bring communities and the emergency services sector together. As we have seen from the recent floods in Queensland and NSW following Tropical Cyclone Debbie, people are motivated to assist in response and recovery after disasters. Harnessing this capability is essential for the emergency management agencies, local councils, NGOs and other community groups that work together after disaster.

The new Handbook outlines principles and guidelines that organisations can adopt to support spontaneous volunteers through a set of guiding questions, strategies and advice. It also provides additional case studies and examples of strategies and approaches from Australia and other countries.

The 2017 revision of the Evacuation Planning Handbook draws on expertise across jurisdictions, the emergency management sector, community, government and non-government organisations to review and address changes to evacuation planning and issues that have emerged since the publication of the previous Handbook in 2013.

Central to the Handbook is the safety of community members and emergency responders during the evacuation process and the early return of evacuees to minimise negative social and economic impacts on affected communities. This revision recognises the complexity of evacuations and human behaviour, influences of technology and social media and consideration of evacuation planning for all hazards. Significant development of sections on animal management has also been completed.

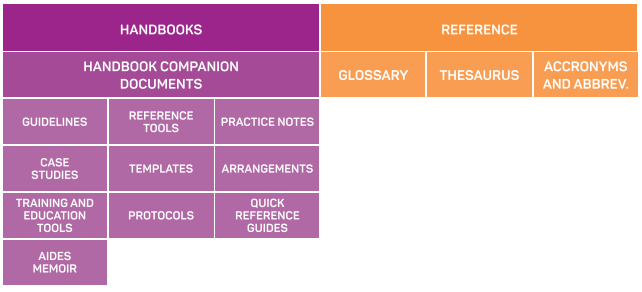
The handbook uses the nationally agreed five stages of the evacuation process as a framework for planning an evacuation: Decision, Warning, Withdrawal, Shelter, Return.

The Evacuation Planning Handbook can be used to prepare evacuation plans before disasters arise, to maximise the efficiency and effectiveness of any evacuation that may be necessary. Evacuation plans may be specific to a hazard and a location or more generic in nature, in recognition of the need to adapt generic plans to the specific time, place and circumstance of a given event.

The following handbooks are being reviewed and developed during 2017-18:

1. Community Recovery
2. Australian Emergency Management Arrangements
3. National Warnings
4. Safe & Healthy Crowded Places and Mass Gatherings
5. Incident Management in Australia.

The Handbook Collection is published on the Australian Disaster Resilience Knowledge Hub at www.knowledge.aidr.org.au/collections/handbook-collection.



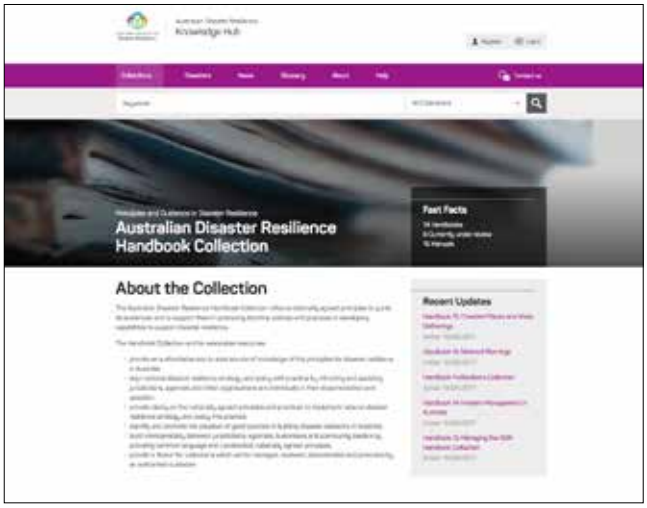

The Handbook Collection and companion documents.

## What is the Handbook Collection?

The Australian Disaster Resilience Handbook Collection outlines nationally agreed principles and guidance in disaster resilience, across different disasters, jurisdictions, contexts and stakeholders.

The principles presented in the Handbook Collection are the result of expertise, experience, learning, theoretical analysis, data analysis, research utilisation and collaboration among agencies, organisations, governments and communities that provide and receive services and support during disasters.

The Handbook Collection provides links across the collection and to other national and international collections to facilitate knowledge–sharing, adoption, implementation and distribution by users across organisations, individuals, jurisdictions, disasters and contexts.



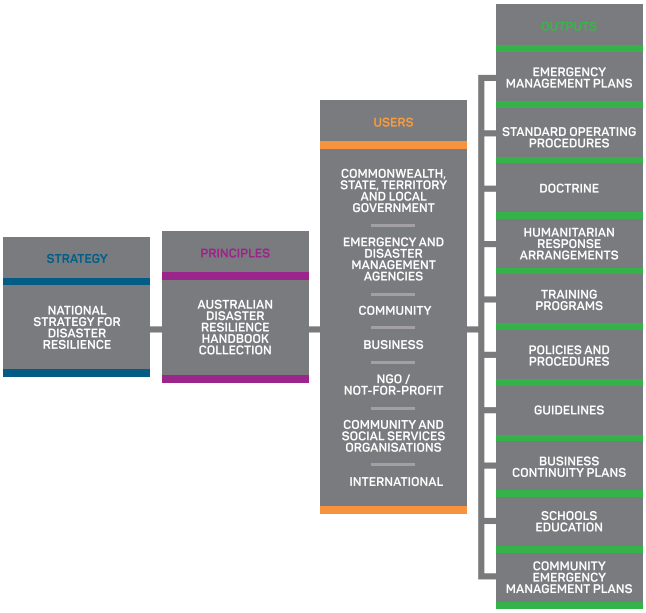

## The future of the Handbook Collection

The first publications in the original Australian Emergency Manual Series were skills reference manuals produced from 1989 onwards. In 1996, the series was expanded to include comprehensive emergency management principles and practice reference publications.

In 2011, handbooks were introduced to align with the *National Strategy for Disaster Resilience*, comprising principles, strategies and actions to help the management and delivery of support services during disasters.

In 2015, AIDR was appointed custodian of the handbooks and manuals to provide guidance on the national principles and supporting disaster resilience in Australia through management and publication of the Handbook Collection.

A detailed examination of the existing Handbook Collection is being undertaken to determine which publications should be retained, where they fit within the Handbook Collection, which should be retired and archived or devolved to another custodian. Retained publications will enter a lifecycle management program for review. This review process will progressively align existing and new publications with the publication style described in the framework.




The Handbook Collection supports the implementation of the National Strategy for Disaster Resilience by outlining the nationally agreed principles in disaster resilience.

There are currently 16 handbooks in the collection as well as companion documents that support adaptation and implementation. There are 15 manuals identified in the manual series that will be reviewed and transitioned into the Handbook Collection. The remaining manuals have been archived or moved to other collections to be managed by other custodians, including AFAC.

The Handbook Collection will continue to evolve as a leading authoritative collection of nationally agreed principles and guidance supporting disaster resilience in Australia.

Presented at AFAC17 powered by INTERSCHUTZ – the annual conference of AFAC and the Bushfire and Natural Hazards CRC.

## ABSTRACT

This paper critiques the adversarial processes used in inquiries following significant natural hazard events, in particular bushfires. Shortcomings identified with current practices suggest post-event inquiries should adopt restorative practices rather than traditional adversarial procedures. Restorative justice is a concept established in the area of criminal law. It is argued that the use of restorative practices could assist in formulating inquiries that would assist all parties to collectively resolve how to deal with a aftermath of the disaster and deal with its implications for the future. Restorative practices would enable a focus on both short- and long-term recovery.

# Reviewing high-risk and high-consequence decisions: finding a safer way

Associate Professor Michael Eburn[1,3] and Emeritus Professor Steve Dovers[2,3]

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## Introduction

Eburn and Jackman (2011 p. 74) state that 'Reforming the inquiry process to ensure that the lessons are learned, without high collateral costs, should be an objective of mainstream emergency management into judicial and quasi-judicial proceedings'. Eburn and Dovers (2012) reviewed the reality, compared to the fear of, litigation arising from the response to natural hazards and in particular, bushfires. It was shown:

> *... it is not liability that is a significant issue; rather, the real issue is the time and emotional commitment involved in responding to post-event inquiries, and the risk of personal blame even when that blame does not equate to legal liability.* Eburn & Dovers 2012, p. 488

Building on that work, this paper critiques the adversarial processes used in inquiries following significant natural hazards. Events and reports on further research are examined to identify an alternative way of conducting inquiries.

### The desire to assign blame

The policy literature takes a critical stance on the motivation for calling post-disaster inquiries (Prasser 2006, p. 34). It is not the 'inherent severity of an ... event' but rather 'the interplay of the politics of blame, public agenda ... and government popularity [that] determines the choice of whether to establish a commission of inquiry' (Sulitzeanu-Kenan 2010, p. 632).

Inquiries often reveal a conscious, or unconscious, desire to assign responsibility or blame (Ewart & McLean 2014).

The desire to find someone to blame reflects the modern focus on 'risk management' (Brändström & Kuipers 2003):

> *[In] ... contemporary risk societies 'chance', 'accident' or 'tragedy' are no longer accepted as explanations for social ills and physical threats, someone must be blamed for their occurrence... Having a scapegoat at hand for ritual sacrifice in the face of public criticism provides senior office-holders with one more option for surviving scandal and demonstrating resolute 'crisis management'.* Brändström & Kuipers 2003, pp. 292, 299

The focus on blame is, however, counter-productive (Ellis, Kanowski & Whelan 2004, pp. 233-234). Finding someone to blame may help reassure the public that governments are legitimate and in control and restore 'fantasies of omnipotence and control' (Brown 2004, p. 107) but it is likely to produce an outcome that is both simplistic and an impediment to organisational learning'.

### Adversarial process

Royal commissions and coroner's inquests often fall back on traditional legal methods and forms. Others have noted the tendency of inquiries to adopt adversarial techniques despite their honest attempt to avoid doing so (D'Ombrain 1997, Elliott & McGuiness 2002, Brändström & Kuipers 2003, Prasser 2006, Sulitzeanu-Kenan 2010). D'Ombrain (1997) argues that the 'adversarial conduct of investigative inquiries is reducing their public policy value'.

The tendency to adopt adversarial techniques is not surprising given that inquiries are often chaired by former judges and assisted by counsel. In those circumstances the adoption of a legal mode of inquiry may derive more from custom and practice than inquiry requirements (Pascoe 2010, McGowan 2012). That is not to say that adversarial processes are not without defenders. Pascoe (2010, p. 398), one of the Victorian Bushfire Royal Commissioners, said that the court-like approach 'has the ability … to instil high levels of public confidence in the integrity and robustness of the process'. Prasser (2006) argues that '… the adversarial nature of inquisitorial royal commission hearings with public cross-examinations of witnesses reinforces the open and independent nature of their investigations'.

Whether adversarial inquiries instil public confidence, they do have consequences for those who are called before them (Eburn & Dovers 2012). Regehr *et al.* (2003, p. 617) identified that involvement in 'post-mortem inquiries' '… was associated with significantly higher levels of traumatic stress symptoms and depression' and there is 'strong support of clinical impressions that have suggested that many emergency responders experience the review process as more taxing than the critical event itself'.

Thomson (2013) reported on the experiences of firefighters who had responded to catastrophic fires. Although her book was meant to be a reflection of the effects of firefighting, it is apparent that one of the most traumatic events that many of the contributors faced was the post-event inquiry (Thomson 2013).

## Being heard and telling the story

Telling a story is a more effective way to communicate than simply relating uncontested facts (Gottshcall 2012). The 2009 Victorian Bushfires Royal Commission knew of the need to hear stories. The Commission heard from witnesses 'who were directly affected by the bushfires and who told their personal stories orally to the Commission (but who did not represent a particular organisation)' (Victorian Government 2013).

Other people who were involved, including firefighters and emergency managers, did not get to tell their story in such a direct way. Witnesses are subordinate to the inquiry chair and the lawyers assisting the commission or representing parties before the commission or inquiry. It is the commissioners or coroner and counsel who determine which witnesses will be called and what matters will or will not be the subject of investigation. Witnesses are left with the role of answering questions asked by counsel rather than taking an active part in reviewing and understanding the events that have affected them. It is counsel that makes submissions to the commissioners or coroner as to what inferences and findings are evidence. It is up to the tribunal to determine what recommendations should be made and what understandings to draw from the evidence (*R v Doogan* [2005] ACTSC 74, ALRC 2009, Select Committee on the Inquiries Act 2014, Zehr 2003).

## Looking for a safer way

If inquiries tend to allocate blame even though it is a barrier to learning and adopt adversarial processes that do harm to responders, then a better and safer approach is required.

Restorative justice is an increasing feature of criminal justice systems (Marshall 1996). Further, the use of restorative justice principles outside criminal law is growing. Restorative principles lie behind attempts at peacebuilding (Llewellyn & Philpott 2014) and post-conflict inquiries (Daly 2004, Braithwaite, Charlesworth & Soares 2012). Restorative justice practices are suggested as appropriate response for industrial disasters (Cooper 2008).

In 2017, Nova Scotia, Canada established the 'Nova Scotia Home for Colored Children Restorative Inquiry'. Two of the goals of the inquiry are to 'support collective ownership, shared responsibility and collaborative decision-making' and to learn 'what happened, what matters about what happened for the future, who was affected and how, and the contexts, causes and effects of what happened…' (Nova Scotia 2015, p. 6). These goals would be fitting in an inquiry into a complex event such as the Canberra fires in 2003 or the Black Saturday fires of February 2009.

While responding to fires and floods is not an issue of criminal law (even if the fire is caused by arson) there are similar issues. The events cause loss of property, life and a sense of security. Communities and people are traumatised by these losses and the impact on their lives. They may feel that the emergency management agencies failed them in preparation and planning for, and the response to, the event. Responders are also members of the affected communities. Emergency service personnel who are responding on behalf of their community may feel let down if their actions aren't valued or honoured by the community, or if they feel

their agency didn't properly support them or allow them to take actions that they thought were required (Regehr *et al.* 2003). Responders and government staff also live in the affected communities and can be both victims as well as receive blame and criticism for their actions (Thomson 2013). Just as crimes cause harm that needs to be repaired (Zehr 2003), so do significant natural hazard events.

If the 'offender' is the hazard, the offender cannot be held to account. It cannot be cross-examined or punished or asked to take some measures to make good the damage that it has caused; but responders, those who are entrusted to protect communities from the hazard, can be. This can give rise to a circle of blame where those who have lost may blame governments, agencies or responders for their alleged failings and may, in turn, be blamed for their lack of preparation, failure to remain informed about conditions or failure to take the advice of the emergency services.

One form of restorative justice practice is Victim Offender Reconciliation Program (VORPS).

> *In VORPS, restorative justice takes the form of a face-to-face encounter between the victim and the offender, facilitated by a trained mediator, who is preferably a community volunteer. The mediator's role is not to impose his or her interpretation or solution upon the 'parties to the conflict', but to encourage them to tell their stories, express their feelings, ask questions of each other, talk about the impact and implications of the crime, and eventually come to an agreement about what the offender will do to make restitution*. Johnstone 2003, p. 3.

Adopting a similar practice after a disaster event allows those affected to come together with a trained mediator or facilitator to hear each person's perspective on the event. The mediator would not 'impose his or her interpretation or solution upon the parties… [but] encourage them to tell their stories, express their feelings, ask questions of each other, talk about the impact and implications … and eventually come to an agreement …' (Johnstone 2003, p. 3).

In this forum, questions could be asked about why things were done, or not done, and how decisions by responders and other members of the community affected people and the ultimate outcome of the event. Decisions about how the local community will prepare for and respond to future events could be agreed. This method of post-event inquiry could facilitate 'a virtuous circle of owning responsibility' (Braithwaite & Strang 2011, p. 10).

There would still be a place for royal commissions or other formally appointed enquiries. Eburn and Dovers (2015) argue that a new model of inquiry might involve '… an independent inquiry panel, similar to the current royal commission model, supported by specialist panels to investigate issues that are raised by the particular event…'. The use of restorative practices (rather than adversarial ones) allow communities to inform inquiry panels and 'resolve collectively how to deal with the aftermath' (Marshall 1996). Rather than 'hear' evidence and submissions, before 'handing down' findings and recommendations, the inquiry could collate reports from affected communities and report to government and agencies what the communities identified as causes of the tragedy and future solutions.

Restorative practices offer greater opportunity to look forward. Inquiries tend to be backward-looking, identifying underlying social and physical conditions that led to the disaster and how the response was managed. Restorative practices that allow people to make sense of the event and allow communities to engage in recovery pre-planning. By hearing from all participants, communities could reach a better understanding of what is prioritised for attention after an event and who will take on what responsibilities.

## Testing the ideas

It is unlikely that any jurisdiction will simply adopt a new model of inquiry after the next major event. What will be required is for agencies or inquiries to consider adopting restorative practices. Already some inquiries are moving away from adversarial procedures to more inclusive processes (Ferguson 2016, Keelty 2011). (It might be noted that neither of these inquiries were headed by former or serving judges or legal practitioners).

The US Forest Service has also moved away from inquiries that look for blame; instead seeking to hear stories from those involved in accidents or near misses to understand how and why decisions were made. The premise of their action is that everyone is trying to do a good job, so if a decision was made that led to a poor outcome, it must have looked like the sensible decision at the time. By hearing the stories of those involved, in an environment that guarantees no punitive action, the Forest Service learns why decisions were made in order to inform future decision-makers (US Forest Service 2013).

For Australia, the approach may be to start locally. If fire and emergency services organisations adopted a restorative practice approach for internal inquiries into accidents and near misses it would be possible to build confidence in, and evidence for, the process. If it is established that the system is effective and can lead to learning without blame or harm, then that would support moves to increase the practice to larger inquiries involving the emergency agencies and broader community interests. The next large public inquiry would be served by incorporating restorative practices into their procedures. This may assist in the learning from the event and the restoration of community relationships for future resilience.

## Conclusion

This paper considered why inquiries like royal commissions and coronial inquiries tend to fall back on legal or courtroom methods. The desire to learn can be

lost or overtaken by other factors including a desire to lay blame. The use of traditional, adversarial techniques limits the ability of people to tell their stories, to reflect on what an event means for them and to reach a consensus of what the event means for them and their community in the future. Witnesses are asked questions and findings and recommendations are handed down.

It is argued that a new approach is required. It is suggested that the principles of restorative justice, originally developed in the criminal law, may hold a promise for more effective, holistic and community based learning. Moving to a new, community based model of post-event learning will take leadership and confidence from the emergency management community, but it may be a way to learn more, without sacrificing the goodwill of responders.

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## ABSTRACT

This study undertakes an economic analysis of flood mitigation options for a high flood-risk catchment in Adelaide. To date, economic analyses have focused primarily on estimating the tangible (market) costs and benefits of mitigation strategies and have largely ignored the intangible (non-market) costs and benefits. This analysis improves upon previous studies by conducting a benefit-cost analysis that incorporates the intangible costs and benefits of mitigation. The benefit transfer method was used to include intangible values in the analysis. It was found that, for this particular case study, the inclusion of intangible values does not change the attractiveness of the mitigation options evaluated and the benefit-cost ratios remain below one.


# Integrating intangible values in economic analyses of flood mitigation: a case study of the Brown Hill and Keswick creeks catchment in Adelaide


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## Introduction

To be able to select the most beneficial mitigation option for floods, management agencies need information on a broad set of disaster impacts: direct and indirect, tangible (market) and intangible (non-market) impacts. Direct market losses are those directly caused by the flooding water, resulting from the physical damage to buildings, their contents, infrastructure, etc. Indirect market losses correspond to the flow-on effects caused by the flood, such as business disruptions and clean-up costs that may occur inside or outside the flooded area and can span over a long period. Floods can also cause direct and indirect damages to things that cannot be easily measured in monetary terms (intangible values), such as environmental assets and social values (see Figure 1). Tangible flood losses are usually well documented but intangible losses are typically ignored because they are difficult to quantify. Intangible goods and services are not exchanged in markets and do not have prices, thus assigning dollar values to them is a complex exercise that requires resources and specialised knowledge. However, intangible losses may be substantial, and in some cases, more important to people than tangible losses (Joseph, Proverbs & Lamond 2015). Ignoring intangible impacts may lead to sub-optimal decisions.

One of the shortcomings of standard benefit-cost analyses (BCAs) is that they rarely include intangible values (Hammond et al. 2015, Hansson, Danielson & Ekenberg 2008). For floods, only DEFRA/EA (2005) and Joseph and colleagues (2015) have estimated the dollar values of intangible impacts, but these values have not been incorporated into BCAs. The purpose of this paper is to incorporate intangible flood losses into a BCA, using the Brown Hill and Keswick creeks catchment in Adelaide as a case study. This approach is also relevant to other natural hazards, and economic analyses of mitigation for other hazards need to include intangible impacts.

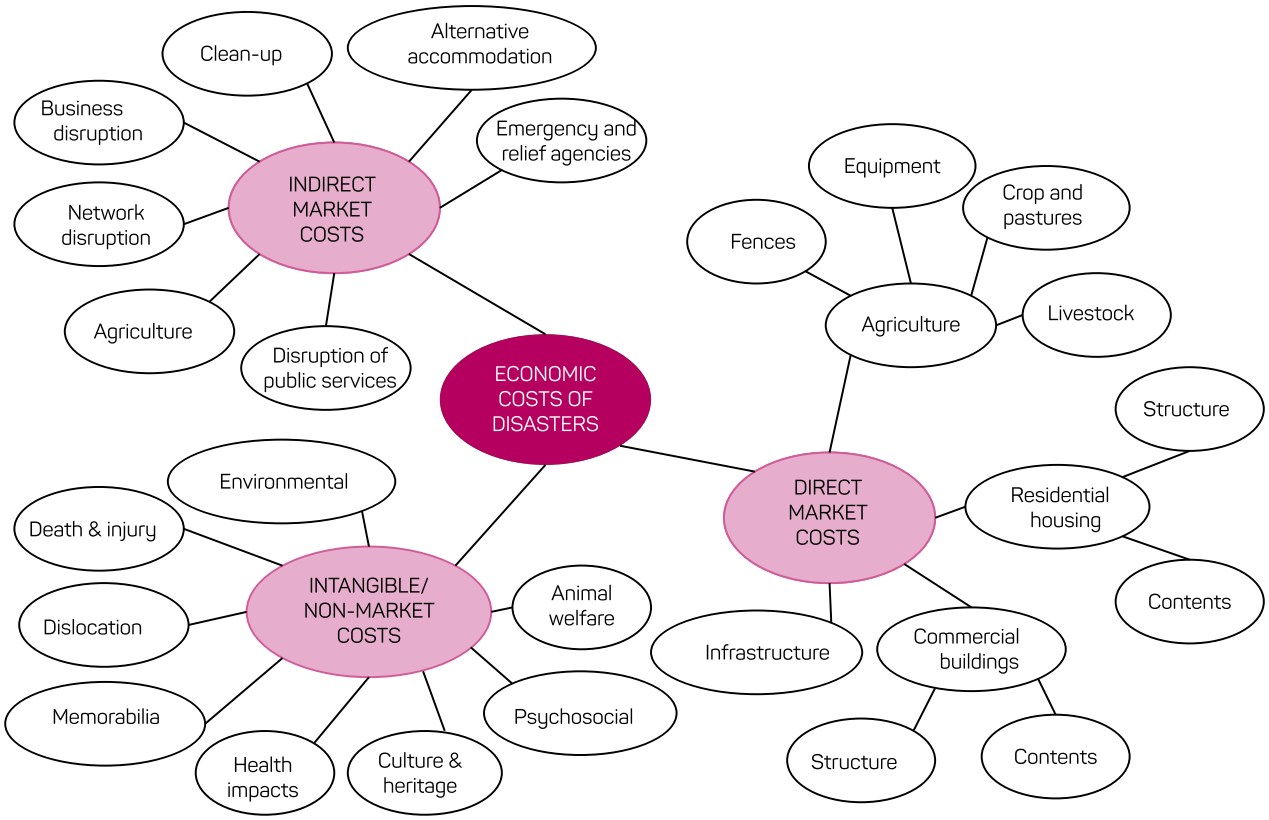


Figure 1: Cost of natural disasters.

# Methods

## Case study area

The catchment has four creeks that are important drainage watercourses in metropolitan Adelaide (see map in Figure 2). The five councils in the catchment (Adelaide, Burnside, Mitcham, Unley and West Torrens) have a combined population of 233,000 (about 86,000 households) and 38,000 businesses. About 2,090 households and 350 businesses are located in the 100-year floodplain, including Adelaide airport. The risk of flooding is relatively high, but until recently there were no clear plans for mitigation due to a lack of agreement between the councils affected (BHKCP 2016). Widespread flooding has not occurred since the 1930s, but the catchment has experienced moderate flooding in recent years (2005, 2016).

## Mitigation options evaluated

The purpose of the planned works is to mitigate the impact of major flooding in the area up to a 100-year average recurrence interval (ARI) flood. The catchment experiences flash flooding, which means that there would be little or no warning before a flood occurs and limited time to prevent direct flood losses. Thus, large structural works are necessary to mitigate flood impacts. The works are divided into two parts (BHKCP 2016):

- Part A works - designed to mitigate flooding in the lower parts of the catchment.
- Part B works - intended to mitigate flooding from the upper Brown Hill creek. Part B will only be implemented once Part A is completed.

In this study Part A was evaluated and three options from Part B (B1, B2 and D). Options B1 and B2 involve the construction of dams in a recreational park and have generated considerable community opposition. Option D involves creek upgrades to contain higher water flows and is the preferred option by the community (BHKCP 2016). All Part B options are expected to achieve a similar level of protection.

## Economic analysis of tangible values

The economic attractiveness of each option is evaluated against a baseline scenario of doing nothing (i.e. no mitigation). The most recent BCA conducted for the mitigation works (BHKCP 2016) includes damages to residential, commercial and industrial properties, infrastructure, clean-up costs, emergency assistance grants and business disruptions. Because Adelaide airport is located in the catchment, business and infrastructure disruption could be significant. In BHKCP (2016), impacts on the airport were estimated through interviews with airport owners and other stakeholders. Although the importance of intangible losses was recognised, only tangible flood losses were assessed. Table 1 shows these losses per event as reported in BHKCP (2016).

Losses per event are converted to average annual losses (AAL) that combine the losses per event with

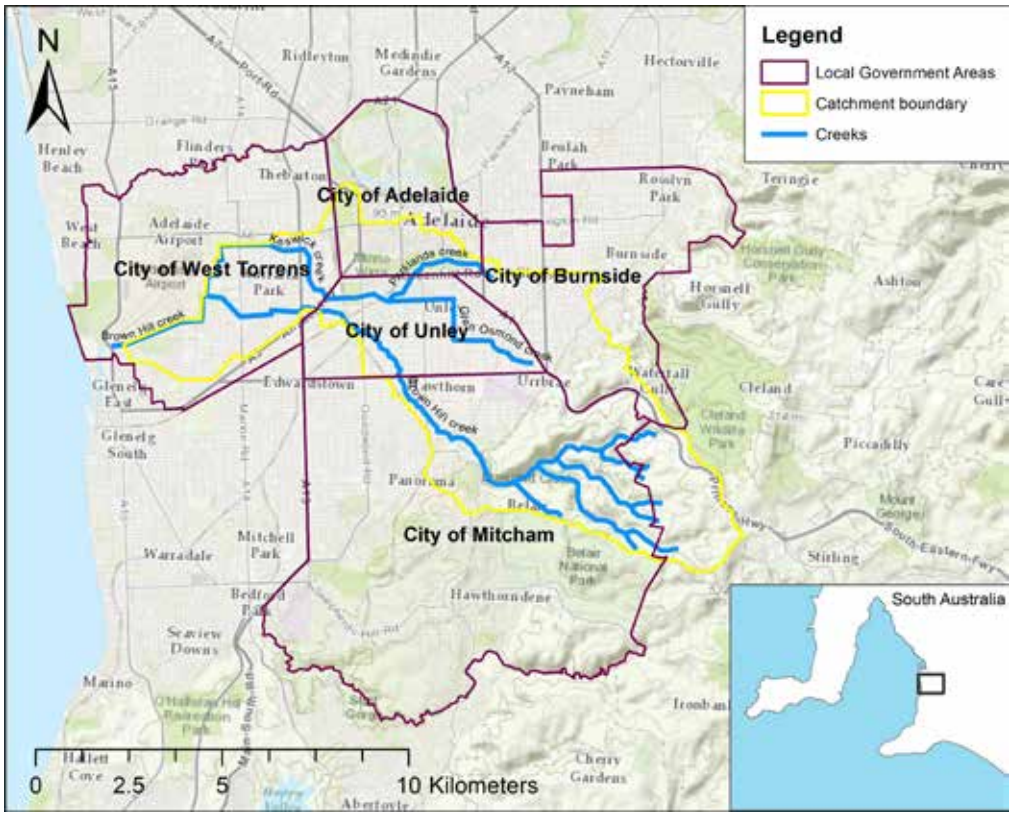


Figure 2: Brown Hill and Keswick creeks catchment, Adelaide, South Australia.
Source: BHKCP 2016

Table 1. Tangible flood losses per event (AUD '000).

| | | | Parts A + B | | |
|---|---|---|---|---|---|
| ARI (years) | Base case | Part A | B1 | B2 | D |
| 10 | 4,800 | - | - | - | - |
| 20 | 10,600 | - | - | - | - |
| 50 | 45,000 | 9,000 | 400 | 400 | 400 |
| 100 | 122,200 | 30,500 | 810 | 810 | 810 |
| 500 | 434,400 | 181,700 | 181,700 | 181,700 | 181,700 |
| PMF* | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 | 1,000,000 |

*PMF: Probable Maximum Flood
Source: BHKCP (2016)

Table 2. Tangible average annual losses for different scenarios (AUD '000).

| | | | Parts A + B | | |
|---|---|---|---|---|---|
| Tangible damage | Base case | Part A | B1 | B2 | D |
| AAL | 5,966 | 2,228 | 1,918 | 1,918 | 1,918 |
| Reduction in AAL | | 3,738 | 4,048 | 4,048 | 4,048 |

Source: BHKCP (2016)

the probability of each event. The benefits of mitigation correspond to reductions in AAL. Table 2 shows the results reported in BHKCP (2016).

## Including intangible values

Intangible values can be estimated by surveying people to elicit their preferences and inferring from their answers their willingness to pay (WTP) for intangible assets (Johnston, Rosenberger & Rolfe 2015). These techniques are usually resource-intensive and expensive, and thus an alternative method has been developed, called 'benefit transfer', which involves transferring values from existing studies and adjusting them to a different context (Johnston, Rosenberger & Rolfe 2015).[1] Since there are no studies estimating WTP for avoiding intangible flood impacts in the case study area, the benefit transfer method is relevant to this analysis. Although high uncertainty is attached to the values derived from overseas studies, it is better to include information with uncertainty than to ignore it completely (Pannell & Gibson 2016). A sensitivity analysis was conducted to deal with the uncertainty associated with these estimates. Table 3 provides details on the intangible values included in the analysis, how these values were estimated, and the dollar values assigned to them. For more information on the references reviewed, see Chalak and colleagues (2017).

1 Other methods exist for estimating WTP for intangible assets based on observations of existing markets, but these are also resource intensive and require large amounts of data. If intangible assets are not measured in dollar values (WTP), they cannot be fully integrated in BCAs.

# Results

AAL for intangible values are presented in Table 4. The largest intangible value is morbidity, as people put relatively high values on reducing flood-related stress. The second largest intangible value is road traffic delays that would affect a large number of people. Conversely, mortality is low because flood fatalities are rare in the catchment. Other intangible losses are also low, primarily because floods in the area tend to recede relatively fast (BHKCP 2016). Recreation and cultural heritage have a value of zero for the base case (there is no loss without mitigation) but an annual intangible loss is incurred by the construction of a dam (options B1 and B2).

Table 3. Intangible values, analysis and estimated dollar values (AUD).

| Intangible item | Definition | Dollar value (2016) | Method used for estimating each intangible |
|---|---|---|---|
| Mortality | Value of a statistical life (VSL) (per person) | 4,320,000 | The number of fatalities was estimated as a function of likely flood depth in the catchment for different ARI floods. Total number of fatalities was then multiplied by the VSL. |
| Morbidity | WTP to avoid or reduce flood-related health impacts (per household per year) | 516 | Morbidity costs were estimated annually for the total number of households at the risk of a 100 year ARI flood under the different mitigation options. DEFRA/EA (2005) surveyed people exposed to this level of risk in the UK. This value was adjusted for income differences. |
| Recreation | WTP for recreation in an urban park (per household per year) | 35 (for users of the park)<br>17 (for non-users) | WTP for user (non-users) of an urban recreation park in Australia was adjusted for income and multiplied by the annual number of visitors to the park (nearby residents). |
| Electricity outage | WTP to avoid an electricity outage (per household for a 12 hours outage) | 71.0 | WTP estimates from the literature were adjusted for income and multiplied by the number of households that would experience electricity outage in the event of a flood. |
| Road traffic annoyance | WTP to avoid noise-related traffic annoyance (per person affected per flood) | 1.6 | WTP to avoid noise-related traffic annoyance was adjusted for income differences and multiplied by the potential number of people affected. |
| Road traffic delays | The value of time reliability (per person per hour) | 38.0 | The value of time reliability was multiplied by the potential number of people affected by road traffic delays. A conservative delay of 0.5 hours was assumed. |
| Inability to return home | WTP to avoid the inconvenience of being displaced (per household per hour) | 5.4 | WTP to avoid the inconvenience of being displaced was adjusted for income differences and multiplied by the potential number of people affected. |
| Cultural heritage | WTP for the protection of one monumental tree (per household per year) | 1.7 | WTP for the protection of one monumental tree was adjusted for income differences and multiplied by the number of nearby residents. |

Table 4. Average annual losses for intangible values (AUD).

| Intangible value | Base case | Part A | Parts A + B | | |
|---|---|---|---|---|---|
| | | | B1 | B2 | D |
| *Caused by flood events* | | | | | |
| Mortality | 5 | 2 | 2 | 2 | 2 |
| Electricity outage | 3,900 | 1,500 | 900 | 900 | 900 |
| Road traffic annoyance | 1,100 | 400 | 200 | 200 | 200 |
| Road traffic delays | 550,200 | 166,200 | 101,400 | 101,400 | 101,400 |
| Inability to return home | 14,200 | 5,500 | 3,300 | 3,300 | 3,300 |
| *Arising from the risk of flooding* | | | | | |
| Annual morbidity costs | 1,077,000 | 311,400 | 16,000 | 16,000 | 16,000 |
| *Caused by a mitigation option* | | | | | |
| Annual loss in recreation | 0 | 0 | 32,300 | 32,300 | 0 |
| Annual loss in cultural heritage | 0 | 0 | 10,000 | 0 | 0 |
| **Total** | **1,646,500** | **485,100** | **164,000** | **154,200** | **121,900** |

Table 5. Tangible and intangible average annual losses for different scenarios (AUD '000).

| Type of damage | Base case | Part A | Parts A + B | | |
|---|---|---|---|---|---|
| | | | B1 | B2 | D |
| Tangible[λ] | 5,966 | 2,228 | 1,918 | 1,918 | 1,918 |
| Intangible | 1,647 | 485 | 164 | 154 | 122 |
| **Total** | **7,613** | **2,713** | **2,082** | **2,072** | **2,040** |
| Reduction in AAL | | 4,899 | 5,531 | 5,541 | 5,573 |

[λ] Source: BHKCP (2016)

The combined AAL figures for tangible and intangible values are shown in Table 5. When intangible values are accounted for, AAL are between 8 per cent and 23 per cent larger, but the ranking of the mitigation scenarios remains unchanged.

These benefits need to be compared to the costs. The costs of implementing Part A alone are $111 million and the costs of Part B are $41, $44 and $36 million for options B1, B2 and D, respectively. Since Part B is an add-on to Part A, total costs are the sum of Parts A and B. Therefore, the total costs of combining Part A with options B1, B2 or D are $152, $155 and $147 million, respectively. These costs are assumed to be spread over a period of seven years, the time that it will take to complete the works (BHKCP 2016). They also include asset maintenance costs over 30 years.

The benefits are fully realised after completion of the works and only partially realised before that. For present value calculations, a time horizon of 30 years and a discount rate of 6 per cent were used, consistent with the original analysis in BHKCP (2016). The benefit-cost ratios (BCR) and the present values used to calculate them are presented in Table 6.

Part A generates a benefit-cost ratio of 0.44. This means that every dollar invested in Part A generates only $0.44 in benefits. The option that generates the highest benefits is option D ($44.3 million) but the costs ($116.8 million) are much higher, resulting in a benefit-cost ratio of 0.38 (even smaller than for Part A alone). None of the options considered pass the benefit-cost ratio test. In this particular case study, adding intangible values does not change the attractiveness of the options significantly. Intangible losses remain relatively small, representing only between 6 per cent and 21 per cent of total losses. The strong opposition from the community to the construction of the dams is not adequately reflected in the intangible values estimated here. Losses in recreation and cultural heritage are small compared to tangible losses. Although no survey has been conducted to assess people's WTP for having or not having a dam

Table 6. Present values and benefit-cost ratios (AUD million).

| | | Parts A + B | | |
|---|---|---|---|---|
| **Option →** | **Part A** | **B1** | **B2** | **D** |
| Present value of benefits | 38.5 | 44.0 | 44.0 | 44.3 |
| Present value of costs | 88.5 | 121.1 | 123.7 | 116.8 |
| Net present value | -50.0 | -77.2 | -79.7 | -72.5 |
| Benefit-cost ratios | 0.44 | 0.36 | 0.36 | 0.38 |

Table 7. Results with increases in intangible values (AUD million).

| | | Parts A + B | | |
|---|---|---|---|---|
| **Increase in value (%)** | **Part A** | **B1** | **B2** | **D** |
| *Present value of benefits* | | | | |
| 200 | 56.0 | 68.7 | 68.9 | 69.8 |
| 500 | 82.2 | 105.9 | 106.4 | 108.0 |
| 700 | 99.7 | 130.7 | 131.3 | 133.5 |
| *Net present value* | | | | |
| 200 | -32.5 | -52.4 | -54.7 | -47.0 |
| 500 | -6.3 | -15.2 | -17.3 | -8.8 |
| 700 | 11.1 | 9.6 | 7.6 | 16.7 |
| *Benefit-cost ratios* | | | | |
| 200 | 0.63 | 0.57 | 0.56 | 0.60 |
| 500 | 0.93 | 0.87 | 0.86 | 0.92 |
| 700 | 1.13 | 1.08 | 1.06 | 1.14 |

constructed in the recreation park, the fact that the catchment has not experienced major flooding in many years (BHKCP 2016) may contribute to the community's resistance towards the dams, because the discomfort of flooding is not experienced frequently enough to tilt the balance towards supporting additional mitigation measures.

In this study, conservative (lower-bound) values for intangible were used but since no survey was conducted to estimate them, there is a high level of uncertainty attached to these figures. Therefore, it is useful to evaluate how sensitive the results are to changes in intangible values.

## Sensitivity analysis

For the sensitivity analysis, all intangibles were increased by 200, 500 and 700 per cent (Table 7). Regardless of the increase in intangible values, the option that generates the largest benefits is still the combination of Part A with option D. However, on the basis of benefit-cost ratios, Part A generates higher returns up to an increase in intangibles of 700 per cent. Beyond this point, option D becomes more attractive.

For the mitigation options to pass the benefit-cost ratio test, intangible values need to be increased by at least 700 per cent. For such numbers to be valid, households located in the 100-year floodplain would have to be willing to pay roughly $6,000 per year to avoid intangible flood impacts. However, this is unlikely unless people are exposed to more frequent flooding. The literature on this topic shows that households are, on average, willing to pay up to $1,864 per household per year to reduce all flood impacts, and about $1,177 per household per year to avoid intangible flood impacts (Joseph, Proverbs & Lamond 2015, Owusu, Wright & Arthur 2015).

# Conclusion

Intangible values were incorporated into a BCA of flood mitigation for the Brown Hill and Keswick catchment in Adelaide. The results show that the most substantial intangible values in terms of AAL are morbidity and road traffic delay. However, intangible losses remain relatively small compared to tangible losses, representing only between 6 per cent and 21 per cent of total losses.

This study showed that, although intangible values are important, their inclusion does not always significantly change the economic attractiveness of mitigation options. After including intangible values, all options still generate benefit-cost ratios below one. This may be explained by several factors. First, the costs of the mitigation works are substantial; in other flood-risk areas, mitigation may not be as expensive. Second, conservative estimates were used and, since no survey was conducted, there is a lot of uncertainty about the magnitude of these estimates. Third, the catchment is relatively small and is not subject to very frequent flooding. Fourth, other people who would be affected, such as visitors to the catchment and business employees, are not included in the model. Fifth, climate change has not been incorporated in the analysis, which may cause frequent flooding and increase the WTP of residents to avoid damages (and increase the benefits of mitigation). Finally, some intangible values have not been included such as the WTP to avoid losing memorabilia, dealing with insurers or enduring the recovery process.

Some of the information used here was taken from studies evaluating different flooding environments. This catchment would experience flash floods, which are particularly dangerous because water levels increase rapidly and many people could be caught by surprise inside the flooding area. Although efforts were made to adapt the different values to the context of the case study area, another limitation is that studies from different contexts, both physically and socially, have been relied on and this increases the level of uncertainty. It is acknowledged that using information from different environments is a limitation in the study. Also, flood impacts are highly contextual and determined by many factors including flood depth, velocity, warning time, duration of isolation and time of the day. If a flood occurs during the night, it would cause less disruption to traffic. However, this has not been accounted for in the model. Despite these limitations, this study is a step forward in the inclusion of intangible values in economic analyses of flood management.

To better understand intangible flood impacts on this catchment, additional information needs to be obtained from a non-market valuation survey. Such a study would generate more accurate estimates than the benefit transfer method. However, original non-market valuation studies are expensive and time consuming. Benefit transfer provides an alternative approach to determine if it is worth conducting further investigations. The lessons drawn from this study can also inform assessments of other natural hazards.


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# Narrowing the awareness-action gap: cultivating fire-fitness as a social norm through public policy initiatives

Dr Rachel Westcott, Western Sydney University and Bushfire and Natural Hazards CRC.

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## ABSTRACT

This study proposes innovative ways for routine 'fire-fitness' to become a social norm to narrow the bushfire awareness-preparedness gap and thus save human lives. It identifies new, data-driven preparedness policies to help improve human safety in all-hazards emergencies. Public preparedness for natural hazard events requires continual improvement. Addressing this with innovative public health policy and practices aims to more effectively manage the impact of fire and worsening severe weather events on human populations.

The Lower Eyre Peninsula in South Australia was selected as a research site for several reasons including its recent and severe fire history. Data were collected from stakeholders, namely emergency responders and animal owners, to explore, problem-solve and arrive at practical and achievable answers to cultivate a culture of preparedness as a routine activity. Data analysis generated three initiatives with the potential to achieve this, being a new type of workplace leave, financial incentives linked to municipal charges and reviewing management of firebreaks and crop placement in the modern environment of 'conservation farming'. These represent medium to long-term changes to public health and safety policy that can help to make 'fire-fitness' a social norm.


## Introduction

A serious fire affecting people, their livelihoods and immediate social environments (the social 'microclimate') is a complex non-routine social problem (Drabek 2004). Discerning how people and emergency managers can better equip communities to protect themselves and the things they hold dear is an imperative given the evidence-based predicted changes to near-future global weather events. Recent severe natural hazards are acknowledged as an indicator of a 'new normal' of extreme weather (New Scientist 2013, Beynon 2016, Lewis 2016) that requires prioritisation of innovative preparedness initiatives.

Fire science explores an expanding spectrum of fire-related social, physical and agricultural science topics and has become a sophisticated research field in many wildfire-prone countries. This knowledge contributes to the successful and dynamic management of increasingly complex fire problems affecting many aspects of human populations. This study contributes to this knowledge base. It records, documents and analyses some of the experiences, expectations and needs of communities that have 'lived through' bushfire emergencies, and expect to face this hazard again. This paper's research question asks: what preparedness initiatives can be learned from the emergency responder/animal-owner interface that may be usefully applied to the public as a whole and particularly in a bushfire at-risk community.

Using a pragmatic qualitative approach, a case study of a bushfire at-risk regional area in South Australia—'the driest state in the driest continent' (Department of Environment Water and Natural Resources 2016)—was chosen as the research site because of its recent and severe fire history and diversity of animal ownership (South Australian Country Fire Service 2016). Fire can become an emergency when it impacts adversely on people, property, the environment and other assets - including commercial viability, business continuity and family legacy to future generations. Experience of such an event, and loss of any kind, can dramatically impact upon human physical and psychological health for variable timeframes, whether in an urban, semi-rural or pastoral environment (Gordon 2009, Chur-Hansen 2010, Gordon 2015).

Fire approaching the township of Port Lincoln in 2009, taken from the north eastern perimeter.

Image: Michael Reynolds

To help people and their social and physical microclimates become 'fire-fit' requires preparedness behaviour to transition from being a desirable, although time-consuming, 'optional extra' to a regular activity which is as routine as buying the groceries or putting fuel in a motor vehicle. In Australia and elsewhere, household levels of fire-fitness are disproportional to the magnitude of public resources assigned to help people achieve bushfire readiness (Ronan & Johnston 2005, Paton 2013, Westcott *et al.* 2017a). Actively cultivating sustainable patterns of behaviour to establish and maintain a culture of preparedness can be achieved through innovative public policies that build capacity and enhance resilience in the medium and long-term. To do so requires careful consideration of what *precedes* preparedness messaging to create an environment conducive to adaptive action outcomes (Westcott 2017). Paradigm change to cultivate a routine culture of preparedness by means of public policy initiatives is achievable, resulting in a safer society with reduced avoidable trauma and anxiety (Westcott *et al.* 2017b).

## Method

The need for new, practical strategies to evolve and problem-solve natural hazard public policy and practice (Gibbs *et al.* 2013, Gibbs *et al.* 2016) identified a pragmatic approach within a critical realist ontology and contextualist, experiential epistemology as the most appropriate framing for the study (Cornish & Gillespie 2009, Braun & Clarke 2013, Savin-Baden & Major 2013). For further information, this method is described in detail in Westcott *et al* (2017a). Participant groups were emergency responders (operational members of the South Australian Country Fire Service, State Emergency Service, Metropolitan Fire Service and South Australia Police) and the owners of any kind of animal. This included farmers, small business owners and owners of companion, recreational and assistance animals, or carers of wildlife. This demographic is important for two reasons:

- group commonality (owning an animal) crosses the boundaries of many other groups, with 63 per cent of Australian households owning a companion animal (Royal Society for the Prevention of Cruelty to Animals 2014, Animal Medicines Australia 2016)
- the need to investigate new and different groups to discover key reasons why awareness of bushfire hazards does not necessarily translate into proactive, effective prevention and preparedness behaviours, particularly among bushfire at-risk communities.

Data were collected using semi-structured interviews and six focus group discussions with 69 participants. Thematic Analysis (TA) was used for data analysis because of its flexibility and independence from theory. This interpretative, inductive, data-driven approach enabled straightforward answers to practical questions. The recursive process of analysis was coded and managed with CAQDAS[1] software, NVivo 11. A thematic map and table were generated to visualise actively identified thematic inter-relationships in the data (Westcott *et al.* 2017a). Pseudonyms are used to protect participant identity.

## Results, interpretative analysis and discussion

Data analysis of the preparedness theme, 'Be fire-fit: weekly is worth it!' (so-called to connect routine behaviour (fire-fitness) with frequency (weekly) and net benefit (is worth it)) identified three areas of new policy. These areas have the potential to establish prerequisite conditions that favour routine fire-fitness and improve longer-term public health and safety outcomes.

### Catastrophic Day Leave: a formal workplace agreement

In Australia, the public are notified of an approaching 'catastrophic' Fire Danger Rating (FDI) at 4.00 pm the previous day by the Bureau of Meteorology (BoM) (Bierman P. personal communication 2016). This information is available via the BoM website. However, people are faced with the dilemma of what to do on a catastrophic day even if they have a well-written and established bushfire survival plan. A myriad of commitments can present as obstacles, including the requirements of the workplace.

Residents need time to enact their plan. This dilemma, and workplace difficulties experienced by employees when requesting leave of absence during the 2013 'Red October' bushfires in New South Wales, is reported by Wilkinson and colleagues (2015). A formal contractual arrangement with employers could overcome this difficulty.

Catastrophic Day Leave (CDL) is proposed as a new workplace agreement that allows employers and employees to negotiate substituting another type of

1 Computer Assisted Qualitative Data Analysis System

leave or entitlement (e.g. recreation leave or overtime) with an agreed number of CDL days. Potentially, such a policy could encourage others to establish plans and arrangements within their networks, promoting a culture of shared responsibility with mutual workplace and community benefits, thus elevating a culture of bushfire preparedness to 'business as usual' status.

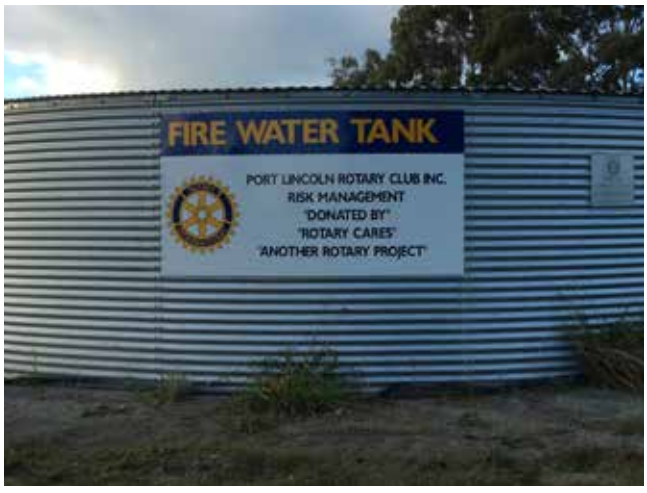
Senior firefighter, Shane, described the dilemma of time-poor families trying to juggle preparedness and their daily commitments:

> *Bushfires…to me are the greatest example of time and motion. The fire is in motion and you've never got enough time… there's so much [to do] at an individual level and in the mosaic of a… community.*

CDL is not intended to replace leave already granted to employees who are emergency services volunteers for the purpose of participating in an emergency response. Nor would it be used for out-of-season preparedness work as this should be done in a property owner's own time on non-catastrophic days. While CDL would not be particularly helpful to people who are self-employed, and catastrophic days could outnumber available days of leave, it recognises and proactively addresses the need to implement necessary societal-wide changes that are proportional to preparing for the 'new normal' of changing weather events (Council of Australian Governments 2011, Gibbs *et al.* 2013, Gibbs *et al.* 2016).

## Financial incentives

Prevention and preparedness initiatives are vastly less costly than response, relief and recovery operations (Attorney-General's Department 2014, McClean 2017). In combination with CDL, carefully designed, locally targeted financial incentives could encourage the integration of widespread fire-fitness preparedness behaviours into daily routines. In the business focus group, Sandy said, 'people respond very well to financial incentive'.




Community fire water tanks around Lake Eyre Peninsula are a constant reminder to people that the threat of fire is ever present.

Image: Rachel Westcott

### Government fees and levies

Currently, emergency services levies are applied in some form to land owners in all Australian states and in the Australian Capital Territory (State Custodians 2017). This is frequently resented in rural areas where land owners may have mainly non-cash assets, usually comprise a large proportion of the available firefighting personnel and resource a response themselves with their own on-farm firefighting vehicles ('farm fire units'). Property owners therefore seem to pay the levy and also fight fires with their own equipment, often leaving their own farms and homes to contribute to community wellbeing. This mismatch could be overcome by separately rewarding best-practice fire preparedness.

Local councils have inspectors with the power to issue fines to land owners on residential or rural living blocks who fail to make their properties fire-ready. A relatively simple extension of this system could see preparedness rebates issued, as well as fines. Arguably, a rewards-based method of acknowledging best-practice preparedness could be more effective than the absence of a fine.

Volunteer rescue officer June spoke with respect to her role as a local government inspector:

> *We have to assess properties annually in October and send notices. I inspect 2,500 properties, rural living and residential properties in my area, and I only send about 120 notices. I hardly ever have to act on any of the notices. But I don't visit farms, you'd just never get around to them all.*

An expansion of the inspectorate would be necessary to include farms. This could be facilitated by the use of 'drone' technology (Unmanned Aerial Vehicles (UAVs)) or by land owners up-loading their own photographic or video evidence for assessment to overcome issues of privacy. Additional costs could be offset by savings because response and recovery are more expensive than preparedness activities (Attorney-General's Department 2014).

### New residents and municipal discounts

Participants in both groups were eager to find new ways to help urban migrants learn more about bushfire hazards for their own and the community's safety. New people could readily receive current information and assistance by attending non-compulsory community fire safety information sessions. They could be encouraged to do so via an invitation accompanying their first Council (Shire) rates notice that offers attendees a meaningful discount on the second year's rates. To qualify, participation in a given number of fire information seminars would be required, which could be spread over a 12-month period to give maximum opportunity for people to participate. This kind of education could overcome new residents' misconceptions, as noted by Shane:

> *They [in the subdivision] believe that we will be there to save their house and horses. But we point out there are three fire trucks sitting in that shed and six hundred homes over that hill.*


Fire conservation towers like this one on Winters Hill outside Port Lincoln on the Eyra Peninsular, provide early warning of fire approach for local communities.

Image: Rachel Westcott

### Community 'Best Practice' rewards

Extending existing community achievement and award programs could be another way to promote a culture of bushfire safety and help build strong relationships with emergency services organisations. Civic awards similar to the 1970s 'Tidy Towns'[2] program, such as 'Bushfire Best-Prepared Towns', could attract additional funding from government or corporate sources. Such initiatives can enhance community pride and collaboration and boost the local tourism economy.

### Property value-adding

Identifying 'bushfire-safer properties' that comply with current Australian Standards (Standards Australia 2009) could help build routine fire-fitness by attracting higher selling prices and encouraging other property owners to similarly value-add. This may be facilitated by linking to a rebate scheme as suggested above, and by applying appropriate annotation. Properties not intended for sale could be promoted as exemplars of fire-fitness by joining existing programs such as the Australia-wide 'Sustainable House Day'[3] or other 'open house' style programs similar to 'open gardens' to showcase and educate others to do likewise. As this concept is already established and understood within communities, extending it to fire-safe properties is an achievable extrapolation.

2 'Tidy Towns' is an initiative of the Keep South Australia Beautiful (KESAB) campaign that began in 1978. It is now known as the Sustainable Communities program. See: www.kesab.asn.au/programs/sustainable-communities/program-information.

3 Sustainable House Day at: https://sustainablehouseday.com/about-shd/.

## Farming practices, fuels and firebreaks

The influences of modern 'conservation farming' techniques on fire behaviour were independently discussed by farmer and emergency responder participant groups. No-till cropping, greater productivity, the popularity of oil-seed crops and reduced farm firebreaks all contribute and need further research.

Sheep and wheat farmer Paul noted:

> *I think with our modern farming we're achieving crop yields that are way and above what we've ever been able to do in the past.... there're two contributing factors [to heightened fire risk] - increased area of crop and also a greater crop residue.*

Farmer Trevor added:

> *Pasture or legume crops wouldn't carry a fire as quickly as canola stubble would, so that's an option with stock nearby.*

From a wheat and sheep property further north, Bob observed:

> *There's been a huge increase in oil seed with canola predominantly, which burns very, very fast [and] very, very hot and that's pretty hard to stop, and there's continuous cropping. Now, every effort is made to retain stubble so the loads on the ground are just enormous. Crop yields have increased I would suggest by 50 per cent over the last 20 years at least, so you've doubled the burnable material that's there to go up and so, of course, it goes like nuts.*

Paul added that a review of firebreaks is overdue in the context of modern farming practice:

> *Firebreaks...won't stop the fire but give you something to burn back to. This could be made mandatory with a council by-law so everyone has to do it. A little bit of loss could mean that a lot of people are safer.*

## Conclusion

Making fire-fitness a routine social norm requires all stakeholders to proactively reassess what *precedes* preparedness to implement changes with medium to long-term public benefit. Proactive campaigns can resonate with more people by adopting innovative social strategies such as CDL and targeted financial incentives. These methods need trialling and evaluation to determine how best to narrow the awareness-preparedness gap. Additionally, further research is required to accurately determine how modern farming practices and crop types influence fire behaviour to unequivocally manage and balance productivity versus safety. Given the predicted increase in extreme weather and fire severity, the challenge of transitioning fire-fitness to become a social norm—thus fortifying community wellbeing in a bushfire emergency—requires a dynamic, problem-solving paradigm melded from science, government and the at-risk communities themselves.

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## ABSTRACT

A key theme within the Bushfire and Natural Hazard CRC Cognitive Tools and Decision Making project is to understand how practitioners learn from research outcomes and how they can use them. Translating research outcomes into practice is a complex process and can be beyond the control of the project team and end-user representatives. Using 'lessons' terminology, it is suggested that observations and insights can be identified from reviewing research outcomes. However, the lessons that are derived from insights are only 'learnt' when they instigate sustainable change (Commonwealth of Australia 2013). To create the best conditions for organisational learning a literature review of learning lessons in emergency management was conducted. Practitioners were also interviewed to understand the contexts and challenges faced in implementing research insights and in facilitating change. This paper presents two studies that examine aspects of organisational learning. In the first study, the challenges to learning from action and experience and from reflection and planning are examined. In the second study, the systems for learning used in emergency services organisations are considered and a preliminary theory of research utilisation maturity is proposed. The initiatives reported help to maximise the value of research and supports innovation through utilisation.

# From research outcome to agency change: mapping a learning trajectory of opportunities and challenges

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## Introduction

There is a well-established literature base that points to better understanding of how research outcomes and knowledge learnt is embedded in practice (Atkinson, Crawford & Ward 2006, Elliot & Mihalic 2004, Eskerod & Skriver 2007, Milton 2010, Williams 2008). Learning from research projects is often hard (Atkinson, Crawford & Ward 2006, Duffield & Whitty 2016, Williams 2008). Williams (2008, p. 262) argues that there is a need for '... wider research into how lessons can be disseminated throughout an organisation and incorporated into organisational practice'. Emergency management is no exception (Donohue & Touhy 2006).

Drupsteen and Guldenmund (2014) suggest that learning starts with the collection of information, followed by processing and storing. However, it is important to get beyond simply processing and storing 'lessons', that is, it is necessary to move from identifying lessons to implementing them. While it is important to have systematic approaches to managing lessons that might be identified, identifying them is not sufficient to bring about improvements. Learning lessons from disasters and crises is important (Borell & Eriksson 2008, Brower, Jeong & Dilling 2009). However, recording, storing and sharing lessons identified does not necessarily infer that anything has in fact (or will subsequently be) learnt (Rostis 2007, Deverell & Hansén 2009). Learning cannot be said to have occurred unless there is change.

Given the dearth of understanding about the processes through which learning in organisations actually occurs and the suggestion that it is so difficult, it seems timely to give attention to the processes of learning and analyse the factors that enable and constrain learning within organisations. This would lead to greater levels of research utilisation.

Owen and colleagues (2015) outlined the findings from an environmental scan identifying what organisations were doing to identify learning opportunities

and the changes needed in practice. The report illustrated how much of that work is structured around what organisations characterised as 'lessons learnt'. Therefore, this paper considers use of research outputs within a lessons learnt framework.

To understand the ways in which agencies might review, assess and learn from research outputs, interviews were conducted with end users to ascertain views on what opportunities and threats could be identified (Study 1) and would be managed if research outputs are to be embedded into organisational learning. These findings are discussed in relation to a parallel study (Study 2) into research utilisation practices employed by organisations in the fire and emergency services sectors.

# Study 1

## Method

A total of 18 interviews were conducted with personnel engaged in operational roles in emergency management and who have responsibility for lessons management processes. The median level of experience in emergency management was 20 years. Interview questions included:

- How would you characterise how this agency learns?
- What kind of processes do you have in place to facilitate organisational learning?
- What do you believe enables and constrains learning and change?
- What do you perceive will be the opportunities and threats to support implementation from the research?

Interviews lasted between 25-55 minutes and were recorded. The interviews were coded in a top-down, theory-driven manner based on learning cycles of action and experience and then reflection and planning (example Kolb 2014, Duffield & Whitty 2016).

## Results

### Learning from action and experience

The participants spoke of how applying research tools in an emergency context can be challenging, in part, because of the unique characteristics presented in an event:

*[We] Can't always have a check sheet 'this is how it will work'. Things are dynamic. Things will change.* (Interviewee with 3-15 years experience)

In addition, while experiences may be similar, each event is based on real-time dynamics and the specifics of each incident. For learning opportunities from research tools to be generalised, the experience from individual cases needs to be systematically documented and the features reviewed to identify further applications.

### Learning through reflection and planning

Given the unanticipated nature of managing emergencies it is perhaps not surprising that some personnel see the emergency services culture as a largely reactive one that presents challenges to learning. One end user indicated that:

*We are such a reactive culture. If something doesn't work the first time, we tend to just throw it out. We don't ask why didn't it work; just 'get me a new one'!* (Interviewee with 18-20 years experience)

The implication here is that the research utilisation initiatives need to ensure there is attention to evidence-based change management. Trials must be carefully managed to avoid this example of premature dismissal.

Planning based on reflection is influenced by the ways people make sense of their experiences so that generalisations can be made. One of the threats to making sense out of experience and reflection is that there is no universally accepted approach to the development or content of debriefs and reviews.

*Some After Accident Reviews are really comprehensive and useful. Others are hard to make out what they* [the participants] *are driving at.* (Interviewee with 6-16 years experience).

Collective sense-making based on reflecting on experience and action requires systematic processes so that alternatives can be envisaged and the implications of other organisational procedures, policy and doctrine can be fully considered.

These qualitative findings on enablers and challenges for learning are supported by Study 2 that reports on a survey on agency practices associated with research utilisation.

# Study 2

The Bushfire and Natural Hazards CRC and AFAC have a continuing interest in enhancing research utilisation. Their stakeholders are regularly surveyed to assess how they use research in order to gain maximum benefit from their investment. Surveys were conducted in 2010, 2012, 2014 and in 2016 (Owen 2011, 2014; Owen, Krusel & Bethune 2016). The early surveys revealed opportunities to improve communication, engagement and collaboration. Subsequent research utilisation strategy focused on these areas at the individual and the industry-wide levels. The 2016 research utilisation survey included opportunity for respondents to provide comments on the plans agencies have in place to keep abreast of research. The data forms the basis of this study reported here.

## Method

The January 2016 survey was distributed to 50 emergency services agencies. Agency contacts were requested to distribute the survey to 5-15 people, using the following stratified sample:

- Senior management: the most senior person in the organisation responsible for the following areas:
  - communication
  - training and development
  - operations
  - community safety
  - knowledge management, innovation, research.
- Five middle managers including regional operational and non-operational personnel (e.g. district managers).
- Five people in operational or front-line service positions (e.g. volunteers, field operations personnel, community education officers, training instructors).

The purpose of this sampling method was to target personnel who could reasonably be expected to:

- have an understanding of the strategic planning of the agency
- have some awareness and involvement in Bushfire CRC and/or Bushfire and Natural Hazards CRC activities
- be responsible for implementing any changes needed based on research evidence.

In the 2016 sample, 266 responses were received from 29 agencies yielding a response rate of 53 per cent, which is appropriate for online surveys of this type (Baruch & Holtom 2008). There was a median of 22 years of experience in the sector and 13 years in their current agency. Of the participants who answered the question about their position in the agency, 28 (15 per cent) were in senior management positions, 126 (66 per cent) were in middle-management roles and 37 (19 per cent) had front-line responsibilities.

## Results

A total of 168 participants provided comments on the processes agencies have in place to keep up to date with research. Initial thematic analyses of the data suggested that participants were reporting qualitatively different types of processes. A sample of the comments provided were coded and discussed between two of the authors drawing on research utilisation practice and innovation found in other sectors, for example health (Baernholdt 2007, Nutley & Davies 2016). Based on the sample, a series of codes were developed and reapplied to a further 30 comments. Once the coders achieved an inter-rater reliability of 88 per cent, the remaining comments were coded and all responses were reviewed and discussed.

Table 1 details the four codes that emerged from the data together with examples. The total number of responses coded to the utilisation maturity level is included in the first column.

These preliminary findings indicate that it may be possible to develop indicators of organisational maturity pertaining to research utilisation. These findings have been reviewed and discussed with practitioners through the AFAC Knowledge Innovation and Research

Table 1: Research utilisation maturity codes and examples.

| Level | Description | Examples in data |
|---|---|---|
| 1<br>N=39; (24%) | Systems are ad hoc and unsystematic. Attempts to keep up to date with research depend on individual effort. | 'Undefined, not clearly communicated within communications. Nil business unit assigned to research and development.'<br>'...the onus for keeping up to date is largely upon individuals maintaining an interest, or subscribing to emails.' |
| 2<br>N=63; (39%) | Some systems and processes are documented which enables research to be disseminated. There is little or no evidence of analysis or impact assessment. | 'We have two people that email CRC updates to staff.'<br>'Lots of material is distributed via our portal and email to keep staff and volunteers informed.' |
| 3<br>N=35; (22%) | There are established processes in place for reviewing research (e.g. dissemination and review either through job responsibilities or an internal research committee). No evidence of how the findings are translated or connected to operational activities. | 'Developed a research committee.'<br>'SMEs appointed as capability custodians to ensure up to date best practice.' |
| 4<br>N=23; (14%) | There is evidence of active connections between research and operational activities. Operational and strategic decisions are informed by assessing research using formal research utilisation processes. These processes and systems are widely understood and embedded in multiple areas of practice. | '... a process of ensuring results are read by key specialist staff involved in program design and delivery, are interpreted and analysed for their implications and relevance and then used to inform decision-making and strategy through numerous internal fora.'<br>'Alignment of evidence-based decision-making in the planning phases of annual planning and the development of indicators around causal factors that inform emergent risk.' |

Utilisation Network. Over the course of three meetings a working model for research utilisation maturity has been developed. A summary of the indicative types of items included is presented in Figure 1.

Figure 1 highlights five core organisational elements identified by stakeholders as important in enhancing utilisation practice. This framework can potentially be used to help end users assess the utilisation strategies for research outputs.

## Conclusion

These findings suggest that more attention on how organisations learn, not just from their own experience but also how they learn and change based on research outputs is required. Linking the insights gained from the interviews together with the development of the template for research utilisation maturity allows evaluation and review of the ways research outputs may be systematically embedded and used by organisations.

| Maturity | | Basic | Developing | Established | Leading |
|---|---|---|---|---|---|
| Element of Research utilisation | | Pockets of research utilisation; not systematically organised | Some systematic recognition and commitment to using research | Using research systematically | Using research proactively to add value to our business and community |
| Structure and Governance | Structure | individual focus not core job | reactive limited follow up | strategic, planned & systematic 'problem solving' | risk taking agile 'problem seeking' |
| | Governance | no systematic quality assurance | project based spasmodic & unconnected | programmatic active management alignment to strategy | organisational transformational change |
| People | | individuals bring skills limited research literacy | person designated some research literacy some interest in building skills | in job roles opportunity to develop skills | questioning & innovation expected continual improvement, change & anticipation |
| Culture | | small pockets value contested | limited in reach & resourcing little challenge of status quo | value widely acknowledged safe questioning | everyone values |
| Support systems and processes | Financial, physical and resources for people | individual influence | stand-alone unit limited connection to business limited implementation | capacity to make change business as usual | core business people mobile, diverse & inclusive borders permeable within & external |
| | Policies, procedures and doctrine | tacit locally organised | limited reach across business | codified and clearly accessible cross referenced | fully embedded and regularly updated with feedback loops |
| | Communication, engagement, participation and collaboration | through passionate individuals not resourced | dissemination one-way "end users" not linked to organisational processes knowledge held as "power | widespread engagement internal and some external to organisation | collaboration between researchers & practitioners widespread integration internal & external collaboration |
| Products | | sit on the shelf not used when individuals leave | one–off, tied to project short-lived | fit for purpose and incorporated into BAU multiple applications | testing and prototyping transformed & applied beyond organisation / sector |

Figure 1: Examples from the research utilisation maturity matrix.

Implications for future research from these findings suggest there is a need to tease out the elements that comprise learning and innovation cultures and to examine what skills, processes and structures are needed. Further work in identifying how perceived barriers can be overcome in order to increase and strengthen cultures of learning within agencies and the industry is required.

The literature review and research interviews identified many suggestions for improving organisational learning. These included embedding roles and responsibilities for learning, review and follow-up; monitoring and measuring change and linking learning and practice. They also suggest that crises could offer opportunities that support learning by exploiting political attention and drawing knowledge from low-complexity, low-risk events. Another key idea is to invest in quality rather than quantity. This translates into fewer exercises but better training that is well targeted at clear objectives.

Given the significant scrutiny placed on organisations and the emergency services sector as well as the pressure to demonstrate an evidence-base to practice, having a strong learning culture would seem essential. As reported, enhancing understanding of what enables and constrains the assimilation of research into practice is already underway. The next steps will be to trial and evaluate a framework for utilisation maturity so these insights may be generalised to other parts of the sector.


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## ABSTRACT

This paper discusses the latest model and theoretical understanding around the concept of organisational resilience as it relates to organisational readiness to handle and manage complex socio-technical system fluctuations. The five key principles of organisational mindfulness are discussed along with what is seen as a nexus between the five principles and modern era complex system leadership theory. Suggestions are offered on how to enhance the collective mindfulness principles through strategic leadership efforts across the workforce, with a view to enabling organisations to become more resilient.


# Developing organisational resilience: organisational mindfulness and mindful organising

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## Introduction

Studies into how organisation can become resilient, while operating in high-hazard environments, sprung out of the research conducted on High Reliability Organisations (HROs) (Weick, Sutcliffe & Obstfeld 1999) in the 1990s. Organisations responsible for operations such as aircraft carriers, air traffic control systems and nuclear power were examined to see how they continued to operate in safety-critical and high-hazard environments. These high-hazard organisations were found to be focused on being ready for the unexpected by strategic efforts of having a high anticipation of what might happen and a readiness to respond through both stable workforce cognitive process and variability in workforce actions (Weick, Sutcliffe & Obstfeld 1999). These two workforce strategies maintain system functioning and provide a platform to manage system fluctuations when the unexpected happens.

Today, organisations outside of the HRO status are recognising the importance of being resilient in the face of unknown and unexpected events and acknowledge that they must strive to respond effectively to complex system fluctuations. Organisational resilience is discussed here with a view to instilling some of the latest insights into this concept and to outline how strategic leadership efforts can enhance organisational resilience as part of organisational strategy.

In studying HROs it was found that a key to their effectiveness was related to the close relationship between the workforce and a repertoire of workforce actions. In particular, the workforce was required to carry out a variety of actions to maintain the stability and resilience of the organisation. This represented a movement away from the standard, ridged and prescriptive processes often valued in organisations and was necessary to enabled system fluctuations to be effectively managed by the workforce at crucial times.

At the group level, workers were expected to take notice of new or developing variables within the system in a sense, increasing the organisational adeptness to become aware of and deal with changing workplace issues as they arise. In essence, workers were found to become collectively 'mindful' of what is happening within the system in which they operate. This allows responses that can manage system and workplace instabilities with a view to preventing escalation into more serious occurrences.

The ability of organisations to be resilient is anchored in cognitive processes of the workforce whose actions need to be flexible, responsive and focused on the best possible outcomes in the face of failure, which may have severe consequences. The notion is that to be successful in managing the unexpected (being resilient) is tied to a workforce attribute of being 'collectively mindful'.

Those working in the workplace health and safety and human factors areas show an increasing interest in the research and application of individual and collective mindfulness to a gain understanding of how mindful cognitive processes effect the workplace and one's propensity towards safe work behaviour, safety occurrences and human error (Hopkins 2002, Sibinga & Wu 2010, Glomb, Duffy, Bono & Yang 2011, Klockner 2013, Klockner & Hicks 2015). A recent, extensive, cross-sectional review of mindfulness and its applications in organisations has shown many benefits (Sutcliffe, Vogus & Dane 2016).

At the group and organisational mindfulness level, five principles grounded in cognitive inquiry and interpretative capabilities for action, make up what is called 'collective mindfulness' (Weick, Sutcliffe & Obstfeld 1999, Weick & Sutcliffe 2001) with these principles identified as the necessary ingredients in organisational resilience. The principles of collective mindfulness are:

- preoccupation with failure
- reluctance to simplify
- sensitivity to operations
- commitment to resilience
- deference to expertise.

These processes are also processes of mindful organising and enable awareness, wisdom and reliability (Weick 2009).

## Organisational mindfulness - five key principles

Organisational mindfulness is described as the extent to which an organisation is able to assess threats that may emerge and capture such detail so they are able to respond quickly and reliably to prevent incidents or system failures (Weick & Sutcliffe 2015). Collective mindfulness is manifest in organisations by the workforce being sensitive to changes in the environment, continuously updating the way staff think and perceive things and by appreciating the importance of context (Weick & Sutcliffe 2001).

### Principle 1: Preoccupation with failure

Preoccupation with failure relates to the way that the organisation and its workforce notice and deal with failures. Failures are not necessarily large safety events but cover issues including deviations, risks, bad news items, surprises, things out of context, near misses and errors (Weick & Sutcliffe 2015). A preoccupation with failure 'is a pre-occupation with maintaining reliable performance... and reliable performance is a system issue' (Weick & Sutcliffe 2015 p. 55).

### Principle 2: Reluctance to simplify

Reluctance to simplify focuses on the organisation's capacity to manage variation and identify signs that the unexpected is unfolding (Weick & Sutcliffe 2015). Successful HROs display a belief that work tasks and the environment are complex systems and they are reluctant to simplify practices, procedures and interpretations (Weick, Sutcliffe & Obstfeld 1999). Simplifications of the way in which interpretations are made of situations are considered high risk and workers are encouraged not to just keep going ahead with tasks when their interpretation and intuition identify anomalies that may lead to dangerous situations (Weick, Sutcliffe & Obstfeld 1999).

### Principle 3: Sensitivity to operations

Sensitivity to operations is a defining feature of a collectively mindful organisation, where the front-line operators display high levels of situational awareness and strive to understand what is happening in the present as well as looking for what may happen in the future (Hopkins 2002). These front-line operators develop an overall big picture of the organisation's operations to prevent accidents and failures through anticipation of future events (Weick & Sutcliffe 2015).

### Principle 4: Commitment to resilience

Mindful organisations demonstrate a commitment to resilience by dealing effectively with errors and unexpected events. They are not disabled by such errors but are able to mobilise in order to deal with them (Weick, Sutcliffe & Obstfeld 1999). These organisations develop anticipation and prediction of potential dangers before they occur. When an unanticipated danger does occur these organisations are able to initiate quick actions and responses to cope and rebound.

### Principle 5: Deference to expertise

Deference to expertise is when the organisation hierarchical structure normally in place is relinquished in an emergency to enable the most experienced people to be the ones dealing with the problem (Weick, Sutcliffe & Obstfeld 1999, Weick & Sutcliffe 2015). Deference to expertise is when experience and expertise must be applied to variations in normal functioning regardless of workforce hierarchical positions.

The five principles do not operate in isolation nor are stand-alone elements. They must be enhanced through a complex systems-thinking lens focused on understanding that social-network interactions and building collective-mindful relationships is required to enable critical co-occurrences to be managed.

## Collective mindfulness

The five principles represent a collective workforce effort in maintaining organisational functioning and ensuring ongoing resilience. Theory supporting collective mindfulness developed into a model put forward by Tim Vogus and Kathleen Sutcliffe in 2012, which endeavoured to answer the questions raised by researchers as to whether collective mindfulness is strategic, driven from the top-down and enduring (Ray, Baker & Plowman 2011) or focused on operations as bottom-up and fragile (Vogus & Sutcliffe 2012).

The model suggested that two actions are in play; that of 'organisational mindfulness' and 'mindful organising'. Both are required for organisations to achieve improved levels of organisational mindfulness.

It is proposed that the two mindfulness actions are undertaken within an organisation but by different levels of the workforce, based on the roles they perform. There are inherent differences between top administrators who are performing the strategic 'organisational mindfulness' role more focused on outcomes, compared to the front-line workers who undertake a 'mindful organising' role, focused on operational outcomes. Middle managers play an equally important role, translating and enabling, between the other two organisational levels, as shown in Figure 1.

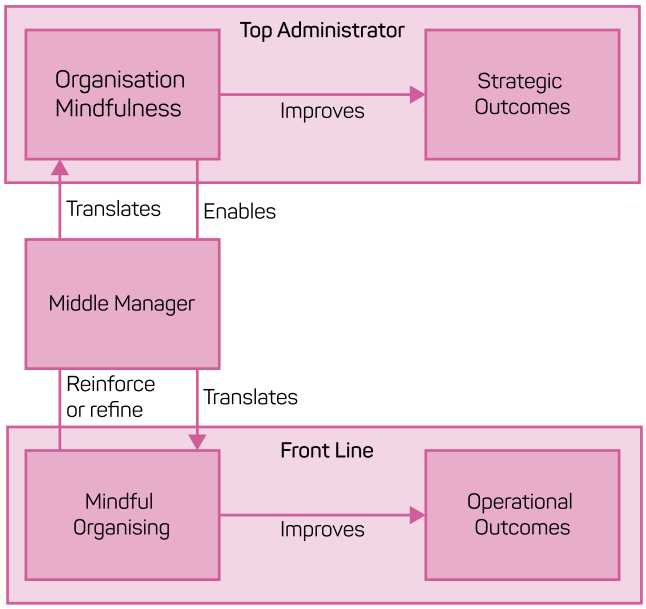


**Figure 1: Reconciling organisational mindfulness and mindful organising.**

Source: Vogus T & Sutcliffe K 2012, *Organizational mindfulness and mindful organizing: A Reconciliation and path forward, Academy of Management Learning and Education.*

## Leadership of complex socio-technical systems

To deal with modern complexity there have been, and continues to be, major theoretical advances in systems thinking and understanding of how work changes in today's complex socio-technical systems. Complex in this respect does not mean confusing. It means interrelated and connected. Leaders find themselves dealing with increasing volatility and uncertainty as interconnectedness becomes one of the biggest challenges facing organisational leaders (Uhl-Bien & Arena 2016).

To cope with this complexity, leaders need to 'apply complexity thinking, where leaders learn to read a system and watch for signs of emergence … those who can apply it know how to use pressures, conflicting, linking up, and timing to anticipate, interact with, and channel emergence' (Uhl-Bien & Arena 2016, p. 17). The response to system fluctuations becomes an adaptive one that capitalises on the collective intelligence of groups and networks (Uhl-Bien & Arena 2016). The point is that there appears to be a strong nexus between the concepts of organisational mindfulness and how current leadership theory suggests that complexity should be handled.

Complex systems theory requires an understanding that managing unexpected fluctuations in organisational systems ranges from managing everyday small system fluctuations through to major events that may require a crisis management approach to re-stablise the system. In both cases, the system, once re-stabilised, will have changed or emerged into a different version of the former. This concept of the management of emergence and system change is shown in Figure 2.

The question is how do organisation leaders, those top administrators (as per the Vogus & Sutcliffe 2012 model), responsible for organisational mindfulness endeavours and strategic outcomes instil resilient and mindful processes and practices in an attempt to ensure system resilience in the face of regular system fluctuations as a dynamic practice? The answer appears to be to enhance strategic efforts to integrate mindful concepts into routine regular work practices as a long-term strategy. This creates a consistency of actions that reduces the gaps between handling regular tasks and normal fluctuations and the response to more precarious unexpected events.

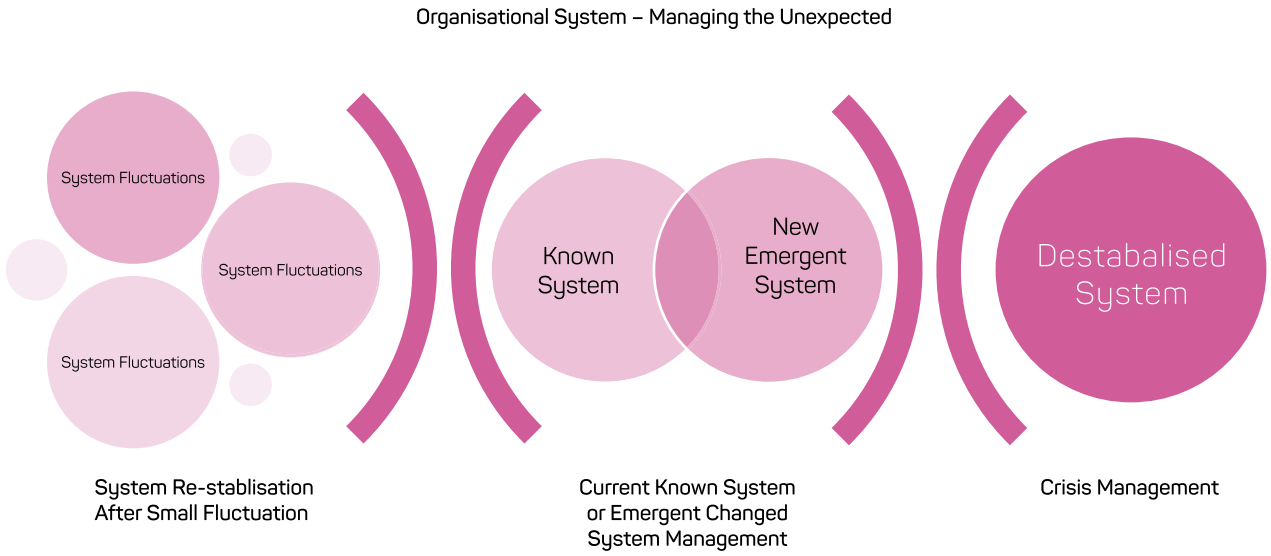


Figure 2: Organisational System Management – Managing the Unexpected.

## Leadership: towards an adaptive management framework

While several questions on how to enhance organisational mindfulness still appear theoretically unanswered, those interested in how to increase organisational resilience can take comfort that organisational resilience theory and its practice has developed to a point of accepted inclusion in business endeavours.

The Vogus and Sutcliffe (2012) model points towards understanding that three main roles come into play within an organisation interested in enhancing organisational resilience, and include the strategic efforts by top administrators, the information transfer role of middle managers and the mindful work at the coal face undertaken by the front-line workers.

Top administrators need to move away from top-down control and isolated strategic planning to embrace the notion that 'adaptive' leadership sustains modern organisational systems. Adaptive leadership has been defined as 'leadership that occurs within the interdependent interactions of emergent collective action and that helps produce emergent outcomes such as learning and adaption' (Schreiber & Carley 2007, p. 232). Schreiber and Carley (2007) suggest two outcomes arise from an adaptive leadership style. It creates conditions that stimulate emergent collective action and it enables collective action responses to filter to managerial level to enable strategic planning and exploration. Complex system leadership theory and organisational resilience theory both point to adaptive management styles as the key for enhancing collective actions in order to maintain system functioning.

Middle managers play a critical role as they link system unity and are a channel for information exchange (Uhl-Bien & Marion 2009). They translate information from the bottom-up and top-down and share information throughout the organisation on conditions and adaptive learning outcomes from front-line mindful organising endeavours. They can also provide connections between elements of the organisation particularly for distributed or decentralised teams. Their role is to ensure that inter-rational elements of the system can and do work in union. The role of middle managers is to minimise the gap between work as perceived (by administrators) versus work as actually done (at the front-line).

Front-line workers need to be 'mindful organising' and for this to happen top administrators need to enhance the five principles of collective mindfulness throughout the front-line workforce. Preoccupation with failure allows pre-emptive information to be shared where there is an accurate reporting system in place and a reporting culture emphasised. Reluctance to simplify is achievable where the importance of employing a systems-thinking perspective is encouraged in front-line workers. Sensitivity to operations occurs where strategic big picture messages are shared with front-line workers and where system thinking encourages the noticing of dynamic system fluctuations. Commitment to resilience is instilled where workers are encouraged and allowed to investigate, learn, make decisions and act without unnecessary control. This fosters a learning and reporting culture. Strategically the message is made clear that learning and adaptation are required to enable human capital components to make dynamic connections. Humans are valued for their thinking, insights, intuition and repertoire of actions. Deference to expertise means that all workers are acknowledged, valued and recognised for their expertise. Humans are seen as assets and encouraged to interact socially to solve problems. The flow-on is that adaptive leadership becomes distributed. Human capital appreciation accumulates in the system in the form of greater knowledge (Schreiber & Carley 2007).

## Conclusion

The research, theory and modelling around the concepts of organisational mindfulness and mindful organising in relation to organisational resilience, particularly that proposed by Vogus and Sutcliffe (2012), reconciles how workforce roles within an organisation might lead to two distinct actions systems; one of 'organisational mindfulness' and one of 'mindful organising' that could be explained across three workforce domains. The intersection of these two concepts is the notion that skilled leadership and management is required for a dynamic relationship between maintaining order and growth and renewal after change. Leaders need to be complex systems thinkers who demonstrate an adaptive leadership style focused on the interactions of human capital and information sharing through social networks. This enables fluctuations in the systems to be effectively managed by workforce actions that can handle the day-to-day operational needs as well as managing the unexpected when it occurs.

For organisational mindfulness to produce strategic and operational resilience it needs to operate holistically across all organisational levels. It must be envisioned by top administrators, synchronised across levels by middle managers and translated into important workforce actions, particularly on the front-line. Front-line workers must be free to take mindful actions by refining processes and routines based on the five principles. The principles need to be espoused and supported by top administrations as part of strategic planning and enhanced by middle managers who translate them into the organisational actions.

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## ABSTRACT

The Cyclone Testing Station (CTS) and partners have conducted forensic damage assessments in Australia following severe windstorm events for over four decades. The information collected is used for building science research that provides the evidence base needed for improvements to building codes and development of damage mitigation solutions. The Queensland Fire and Emergency Services (QFES) operate Rapid Damage Assessment (RDA) teams in the aftermath of major disasters (e.g. cyclone and bushfire) to collect and disseminate information on extent of damage to buildings in impacted communities. These data enables focused and coordinated response in the immediate aftermath of an event and better planning for event recovery. This paper explores the use of QFES RDA datasets in analysing the damaging effects of severe windstorm events. Two case studies are discussed: a supercell that hit Brisbane on 27 November 2014 and Tropical Cyclone Debbie that made landfall along the northern Queensland coastline in March 2017. Where possible, damage data are combined with hazard information (dual-Doppler radar horizontal wind fields) and their relationship is investigated. The analysis demonstrates that RDA data are not only useful in response and recovery phases, but also have value for research aiming to better understand building failures and reduce damage in future events.

# Analysis of rapid damage assessment data following severe windstorm events

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## Rapid damage assessment

Rapid damage assessments are surveys carried out by trained emergency services personnel in the immediate aftermath of disaster events. The surveys assess the condition of buildings in damaged areas so that emergency assistance can be efficiently managed and dispatched. The surveys are generally carried out on foot (by helicopter in remote areas) via handheld electronic devices. Each building is assigned a rating of 'no damage', 'minor', 'moderate', 'severe' or 'total'. Minor damage generally includes damage less likely to affect habitability of the structure (e.g. guttering, fencing) while severe/total damage means the occupant will need temporary accommodation (e.g. roofing and other structural failures). In addition to the building condition, information is recorded for building type (e.g. home, commercial), number of stories, immediate hazards (e.g. ceiling collapse), animal welfare, water height (if applicable) and any other recovery support requirements (e.g. medication, disabilities). In many instances, a short text description and photographic images of the damage are also collected.

Figure 1: Severe structural roofing failure in Proserpine from Tropical Cyclone Debbie.

Image: Cyclone Testing Station

The RDA survey data are by necessity less detailed than forensic engineering assessments but typically cover a much larger area (in a very short amount of time) and capture many more buildings. It is important to emphasise that the primary objective of damage assessment during the surveys is identifying life safety and recovery issues i.e. not necessarily reporting all damage relevant to a typical engineering investigation. Most surveys are conducted on foot from the street and therefore less visible damages are likely to be underreported (e.g. water ingress). Therefore, reported information on damage intensity should be considered as conservative (lower bound) for the true extent of damages. Due to the nature of QFES objectives, RDA surveys are carried out in areas where damage poses a potential threat to life safety (e.g. Figure 1). This means they do not necessarily represent a uniform assessment of damage to structures in all impacted areas. However, in areas surveyed they are largely comprehensive.

## Case study: Brisbane hailstorm, November 2014

On 27 November 2014, an intense supercell struck southeast Queensland with maximum three-second gust wind speeds of 141 km/h and hailstones the size of tennis balls (ICA 2017). While damaging winds did not reach ultimate design limits specified by AS/NZS 1170.2 (Standards Australia 2011) for residential housing, the 141 km/h wind gust recorded at the Archerfield Airport Bureau of Meteorology (BoM) Automatic Weather Station (AWS) was the second highest wind speed ever observed at that station. Furthermore, the supercell led to insurance losses of approximately $1.4 billion, making it the costliest Australian natural catastrophe in 2014 (ICA 2017).

At the time of the event, a BoM S-band Doppler radar (Mt Stapylton) and dual-wavelength research Doppler radar (CP2) were simultaneously scanning the supercell. Beneath the Doppler radar sweeps, two AWSs (Archerfield Airport, Brisbane) were also recording wind data at 10-m (Figure 2). Following the event, QFES conducted RDAs throughout affected suburbs of Brisbane to gather information about the extent of damage caused by the storm. Given the unique collection of Doppler radar, AWS and ground-based RDA data during and after the storm, the damage analysis in this study aimed to compare the lowest available (i.e. 200 m) Doppler radar data with the QFES RDA observations to investigate any relationships between these data.

### Doppler radar data

Doppler radar data used in this study were collected by CP2 and Mt Stapylton Doppler radars, which are both S-band (10.9cm and 10.0cm respectively) wavelength systems with half-power beam widths of 0.96° and 0.90° respectively (Krupar *et al.* 2017). Each radar generates three base moments: reflectivity, Doppler radial velocity and spectrum width.

For the purposes of this study, only reflectivity and Doppler radial velocity data were considered. Radar reflectivity is a measure of the sum of backscattered energy that reflects off a target in the atmosphere and returns to the radar. In a thunderstorm, the reflected backscattered energy is used to assess the intensity of precipitation in decibels (dBZ), where higher values correspond to more intense precipitation (i.e. hail). Doppler radial velocities are the aggregate mean velocity, either towards or away from a radar, of a large sample of targets. Since one Doppler radar can only measure velocity along the emitted electromagnetic beam, two Doppler radars are required to retrieve three-dimensional wind fields. Since CP-2 and Mt Staplyton had overlapping

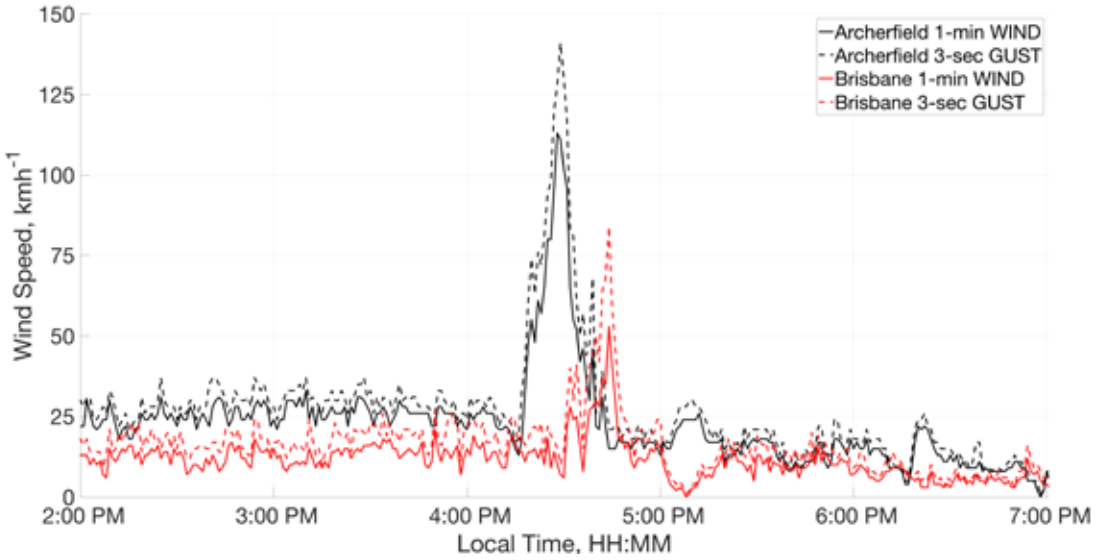


Figure 2: Archerfield and Brisbane AWS one-minute mean wind speed (WIND in km/h) and maximum three-second gust (GUST in km/h) wind histories. Measurements were collected on 27 November 2014 and time is shown in local standard time on the x-axes.

scans, a dual-Doppler synthesis (Krupar *et al.* 2017) was performed to retrieve three-dimensional wind fields over RDA collection regions. Reflectivity and dual-Doppler velocity footprints were generated at 200-metre intervals over the lower 15 km of the atmosphere, where the 200-metre elevation is the lowest possible altitude at which the objective analysis can be performed.

## Damage analysis

A total of 3,343 RDA data points were collected and analysed (Figure 3). To enable damage comparisons with swaths of Doppler-derived wind speeds (at 200 metre height) and radar reflectivity, RDA points were assigned hail and wind damage modes. The assignments were applied based on term searches within the damage description for each point (e.g. search for the word 'hail') and engineering judgement based on the presence of tree damage or debris (i.e. both would result in an assignment of wind damage). In selected areas, the damage assignments were validated by inspecting the photographs. Summary statistics for the hail and wind damage are shown in Figure 4. Of the 3,343 RDA points, 2,720 were assigned hail (2,425 points) or wind (295 points) damage modes. The most frequent observation was minor damage as a result of hail. Wind damage was far less frequent, but often moderate (e.g. failure of fascia, awnings and smaller sections of roofing) to severe in intensity (e.g. complete roof loss).

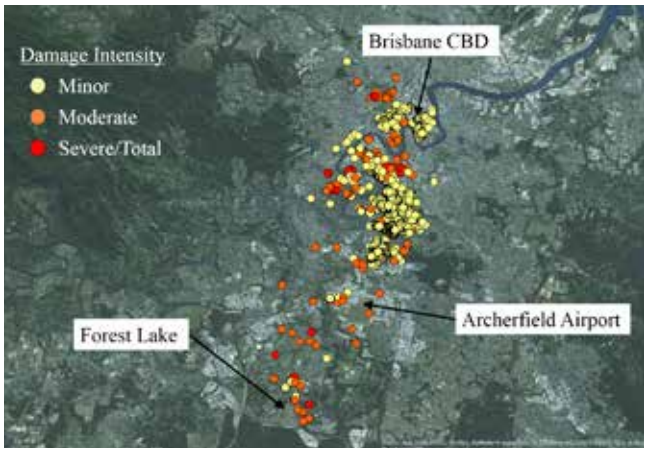


**Figure 3: QFES RDA data for the November 2014 Brisbane severe thunderstorm event.**

Hail and wind damage modes were compared with maximum 200-metre maximum dual-Doppler radar velocity and radar reflectivity data in Figure 5. Wind damage was observed from Forest Lake (southeast of Brisbane) through to the Brisbane central business district (CBD). Hail damage was predominantly confined to the region just south of the Brisbane CBD. As the storm propagated to the north-northeast the suburbs of Archerfield, Moorooka, Annerley, West End, Brisbane CBD, Spring Hill and Herston were worst affected. Areas of highest reported wind damage were located along the east and northeast leading edge of the

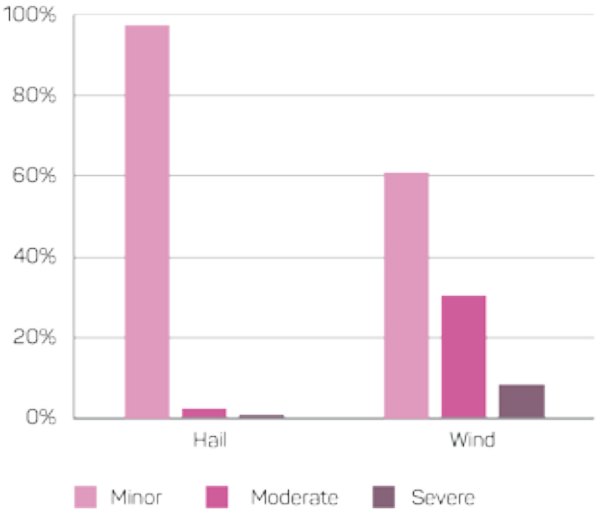


**Figure 4: Summary of hail and wind damage modes observed within the QFES RDA dataset after the supercell thunderstorm passed over Brisbane.**

thunderstorm gust front (i.e. north of Archerfield Airport) with some isolated pockets north of the observed gust front (Figure 5 centre). Over Brisbane, the density of wind damage significantly decreased as the gust front weakened. Most hail damage was collocated with, or a short distance west of, the 200-metre 63 dBZ radar reflectivity contour (Figure 5 right). Considering the horizontal scales of radar data used in this study, the maximum dual-Doppler radar horizontal velocity and radar reflectivity contours show good agreement with the location of peak RDA data point density plots. These observations provide important insight into potential uses for RDA data and how radar information may be processed to help predict the extent of damage for localised wind events.

# Case study: Tropical Cyclone Debbie, March 2017

Tropical Cyclone Debbie was a severe, slow moving storm with a relatively large wind field that crossed the Queensland coast south of Bowen around midday on 28 March 2017. The cyclone caused wind and water damage to buildings in the area between Bowen and Mackay, with the most severe damage in and around the communities of Bowen, Proserpine, Airlie Beach and Hamilton Island. AWSs at Bowen Airport and Proserpine recorded maximum three-second gust wind speeds of 148 km/h and 165 km/h, respectively (Figure 6). Extensive damage was also observed in SE Qld and NE NSW due to flooding several days after landfall. Approximately 11,200 RDA surveys (Figure 7) were conducted from north of Airlie Beach to Brisbane.

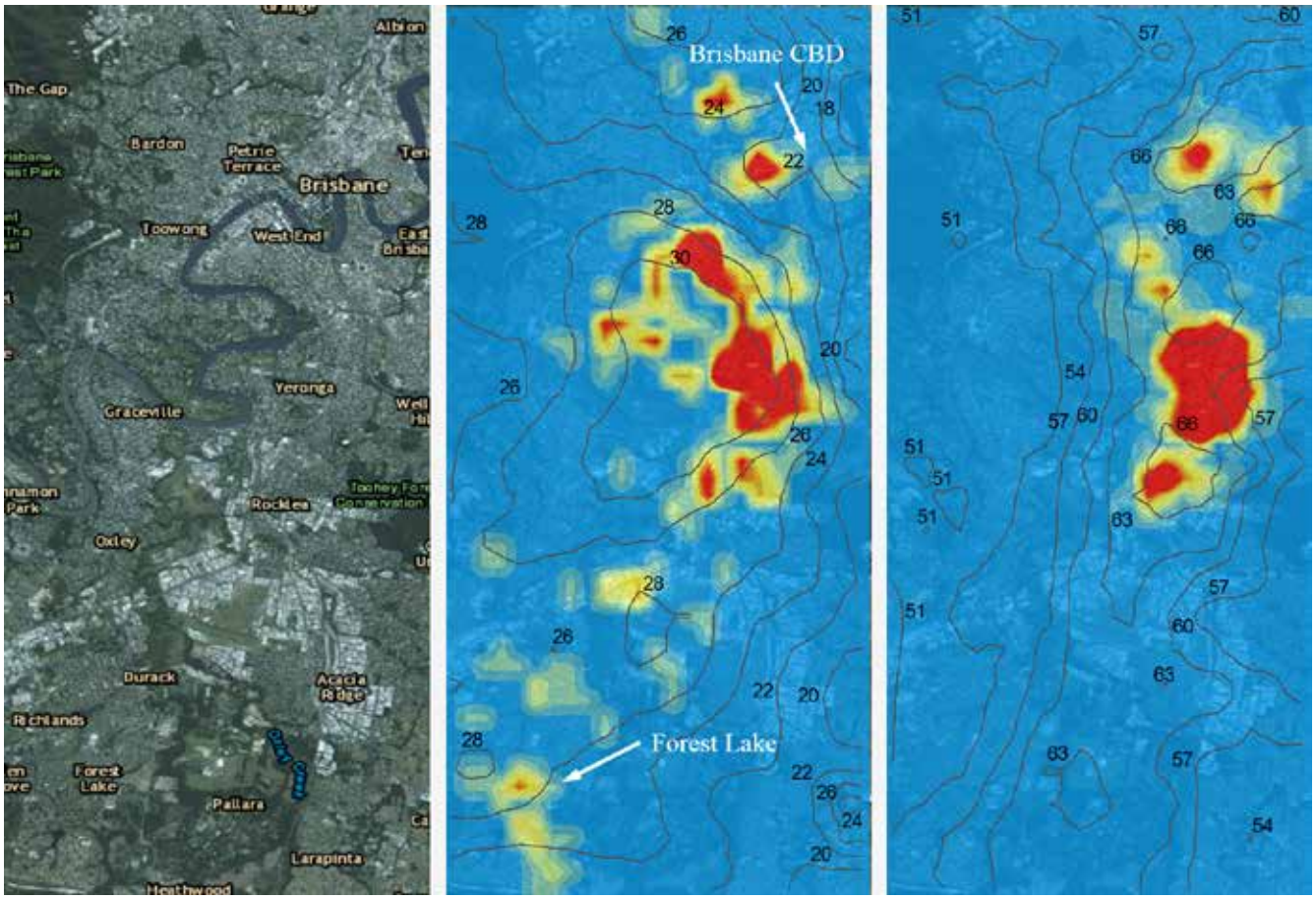


Figure 5: Region of RDA analysis (left), wind damage point density (centre) and hail damage point density (right) based on RDA analysis region. Wind speed (m/s) contours (centre) and reflectivity (dBZ) contours (right) based on radar data analysis.

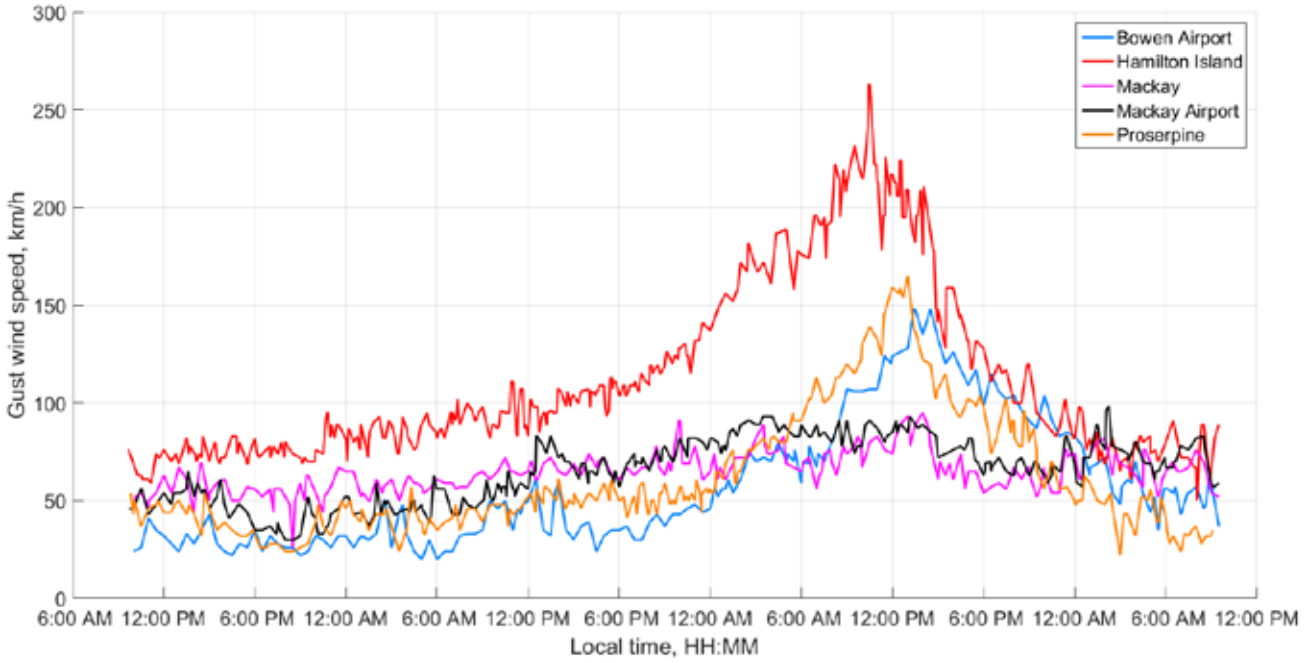


Figure 6: BoM Automatic Weather Station 3-second gust wind speed time histories 26/03/2017-29/03/2017.
Source: Bureau of Meteorology

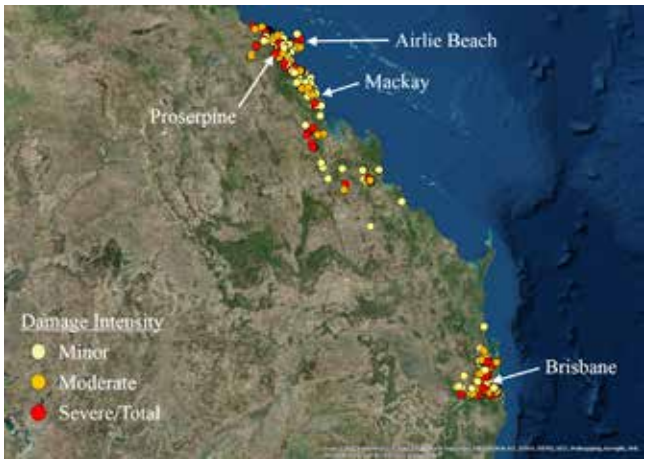


Figure 7: QFES RDA data for Tropical Cyclone Debbie in March 2017.

## Damage analysis

RDA data were collected and aggregated by QFES with assistance from Fire and Rescue NSW during Tropical Cyclone Debbie. Surveys in Bowen and Airlie Beach focused on damaged properties (i.e. very few surveys noted 'no damage'). Surveys of Proserpine were more comprehensive and included an assessment of nearly all properties both damaged and undamaged. 'Minor' damage typically included broken windows, damaged ancillary items (e.g. fences, gutters, awnings, carports) and minor roofing or water ingress related failures. 'Moderate' and 'severe/total' damage included more extreme versions of those failures and frequent water ingress and roofing issues. Lower proportions of moderate and severe/total damages occurred in Proserpine (24 per cent) compared with Bowen (34 per cent) and Airlie Beach (45 per cent).

RDA data were also used to investigate relative damage proportions to building components. Figure 8 shows the distribution based on results of term searches within the damage descriptions. A high frequency of issues related to ancillary items like gutters, fences and sheds. However, of the 2,738 points that recorded damage, 799 (29 per cent) did not include any descriptive comments about the type of damage observed. Furthermore, assessments that did include comments were not always complete (may have mentioned loss of roofing but no mention of fences since roof damage was more important for that building) so the proportions presented should be considered as lower bounds. Complicating things further, all building types were included in the analysis (e.g. houses, commercial, strata) since building type was listed as 'unknown' in most cases. This affected the statistics for damage to components in each of the three regions (e.g. strata properties with flashing are more prevalent in Airlie Beach than in Proserpine).

### Airlie Beach

Inspecting RDA data from Airlie Beach, buildings surveyed included single-family housing (46 per cent), commercial (27 per cent) and unit/townhouse (25 per cent). Water ingress was consistently noted as an issue. For example, comments like '106 units at resort, 40 per cent have water damage, roof gutters and flashing allowing water into units' and '47 units in total, 10 have minor water damage, have lost all gutters and flashing' were common. Of the 19 damaged strata title buildings in Airlie Beach, 10 had roofing damage, eight had significant water ingress issues and seven had damage to flashing.

### Proserpine

The RDA survey in Proserpine was more comprehensive and enabled detailed analysis. Over 90 per cent of buildings were investigated, including damaged and undamaged properties (Figure 9). In many cases, RDA teams (Fire and Rescue NSW and QFES) knocked on doors and discussed damages with property owners. The majority of buildings were single-family homes (81 per cent), commercial (10 per cent) or unit/townhouse (six per cent). Of the 1,283 houses surveyed in Proserpine, 466 (36 per cent) were recorded as having some form of damage.

The most frequently reported damage in Proserpine was water ingress (41 per cent of all damaged buildings). In the majority of these cases there was no mention of roof or window damage, suggesting that building envelopes were not adequately designed to resist wind-driven rain. This issue has been consistently reported in post-cyclone damage assessments conducted by the CTS for the last 40 years, including Tropical Cyclone Debbie (Boughton *et al.* 2017), and is well known to be a dominant form of insured loss during cyclones. Observing water ingress can often be difficult when surveys are conducted from the building exterior. Thus, the 41 per cent proportion should be considered a lower bound for the occurrence of this type of damage. For comparison, the CTS assessment of Cyclone Larry (Melita 2007) indicated that 75 per cent of homes had some form of water ingress damage. The second most common mode of damage was fencing (one in four damaged houses). Considering fence replacement costs can typically range from $1,000 to $5,000, this represents a sizeable contributor to overall losses for the region. Other frequently observed damage for Proserpine included roofing (14 per cent) and guttering (13 per cent).

RDA surveys do not include information about housing age. To examine age-dependent differences in performance, 106 moderate and severely damaged houses in Proserpine were classified by CTS as pre-1980s or post-1980s construction style. Of the 84 moderate and 22 severely damaged houses examined, 53 (63 per cent) and 21 (95 per cent) respectively were pre-1980s. This reinforces findings from previous CTS investigations (Smith *et al.* 2016) indicating that older housing is more susceptible to severe (structural) failures, but vulnerability is less age-dependent for lower damage states (fences, gutters).

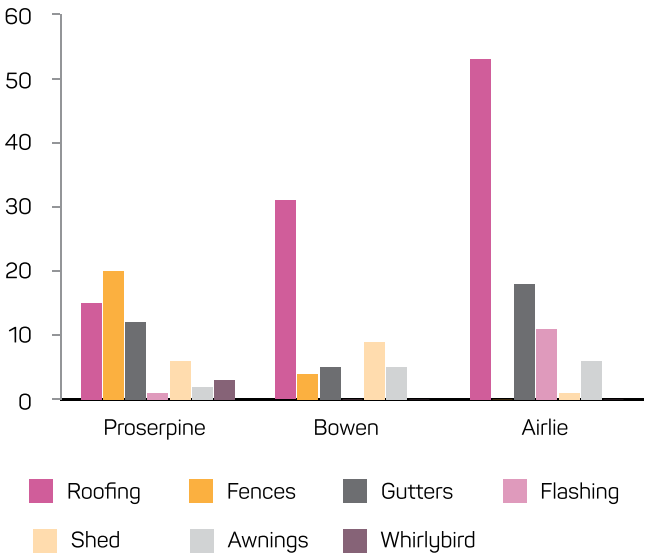


Figure 8: Summary of damages to various components for all building types (e.g. house, unit, commercial) based on analysis of RDA data in Proserpine, Bowen and Airlie Beach.

## Summary and discussion

The two case studies demonstrate the value of RDA datasets. For both events, the data provide a better understanding of the spatial extent of damage, vulnerability of various building types, frequency of damage to various building components and relative severity of damage in different areas. For the Brisbane windstorm, comparisons of RDA with Doppler radar show that the most frequent wind damage occurred along the leading edge of the thunderstorm gust front, while the most frequent hail damage occurred below or just to the west of the 200-metre 63 dBZ radar reflectivity contour. These comparisons suggest that Doppler radar can potentially be used to rapidly identify regions where damage to buildings and infrastructure are likely. For Tropical Cyclone Debbie, analysis of the RDA data highlights key differences in housing performance based on age and demonstrate the relatively high frequency of damage to ancillary building components. From a mitigation perspective, these ancillary items may be 'low hanging fruit' in the sense that upgrades are significantly less costly (in time and effort) than structural retrofits.

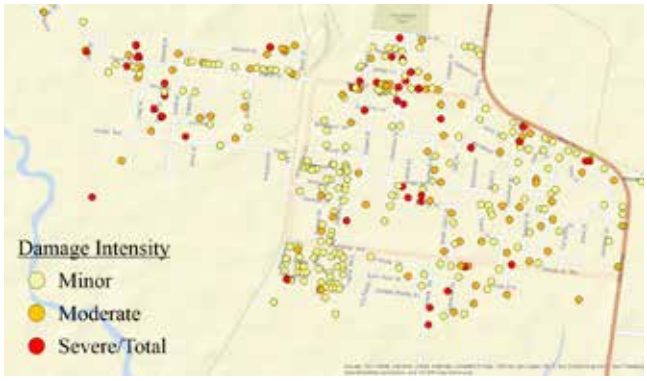


Figure 9: RDA damage points in Proserpine from Tropical Cyclone Debbie (undamaged buildings not shown).

In the future, the quality of RDA datasets could be improved by ensuring that damage descriptions are provided for all assessments and by reducing the number of 'unknown' values nominated for building type and roof type. More Doppler radar and field measurements are required so that when events occur these data can be coupled with RDA survey data and a better understanding of building vulnerability can be gained. Creating a historical record of severe wind events with both wind field information and RDA data may lead to the future use of RDA as a calibrated estimator of wind speeds. In addition, unique datasets like these could be used to rapidly assess likelihood of damage to buildings and infrastructure in near-real time. This could help improve emergency management and financial risk decision-making.

## Acknowledgements

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## ABSTRACT

Disasters contribute to the complexity of urban problems such as water and sanitation, waste management and infrastructure damage. For some countries illegal settlements, slum areas, urbanisation, internal migration and employment dislocation exacerbate these problems. A common urban disaster that occurs in many Asian and Pacific countries is flooding, especially during the rainy season. Floods in Jakarta affect vulnerable communities situated on the riverbank of the Ciliwung River. Temporary shelters have been used in response, but they have not answered the needs of these communities. While many studies argue that socio-economic factors are significant contributors to community resilience, this study found that cultural and historical connections, 'connecting to place', was a significant factor that helps people survive and adapt. As such, relocating communities to safer locations is not always the answer and may contribute to other problems. This study supports designs for temporary shelters and facilities following flood disasters through community-led design processes that meet the needs of communities without disconnection from place, temporarily or permanently.


# Understanding community-led resilience: the Jakarta floods experience


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## Introduction

Global urban transformation caused by population shifts to urban centres has increased exposure to disasters (Killing & Boano 2016). Climate change-driven natural events have severe urban impacts (Watson 2016). Annual flooding is a common urban disaster that occurs in many Asian and Pacific countries, especially during the monsoon season. Flood events are more frequent compared to landslides, wind effects, droughts or forest fires (Marfai, Sekaranom & Ward 2015). In addition, cities are growing ahead of housing and infrastructure planning and development, which affects the capacity to cope of existing urban systems (Watson 2016).

Jakarta is the capital of Indonesia and a megapolitan city with a population of 10 million. It has been dealing with regular flood events for hundreds of years (Hellman 2015). This flooding affects vulnerable communities situated on the riverbank of the Ciliwung River, the main river that runs through the inner city of Jakarta (Hellman 2015). Communities in slum and squatter settlements dominate this area (Marfai, Sekaranom & Ward 2015). Annual flooding is generally classified as a small-to-medium-scale disaster. Such classifications are important for shaping the nature of disaster response (de Boer 1990, Gad El-Hak 2008, Glade & Alexander 2016).

Jakarta is divided into six regions: Central Jakarta, West Jakarta, East Jakarta, South Jakarta, North Jakarta and Thousand Islands. These areas are flat, coastal lowlands with an elevation of less than 10 metres above sea level (Marfai, Sekaranom & Ward 2015) resulting in regular floods that date back to the 1600s (Fiyanto 2014). The Ciliwung River is part of a dense river network susceptible to monsoonal rains and exacerbated by high tides during full moon events (Marfai, Sekaranom & Ward 2015). The worst flood in recent history was in 2007 when 454.8 square kilometres were inundated and caused 5.2 trillion rupiahs in damage (Fiyanto 2014). Eighty people were killed during the flood and around 320,000 people were evacuated (Fiyanto 2014). The urban village of Kampung Melayu in East Jakarta and its neighbourhood precincts has consistently been the area most devastated due to its exposed location.

The impact of flooding is worse for poor or urban communities. Overcrowding, marginal and unstable land, inappropriate or substandard materials and poor building construction are among the factors that increase the vulnerability of riverbank communities during monsoonal floods (Cronin & Guthrie 2013).

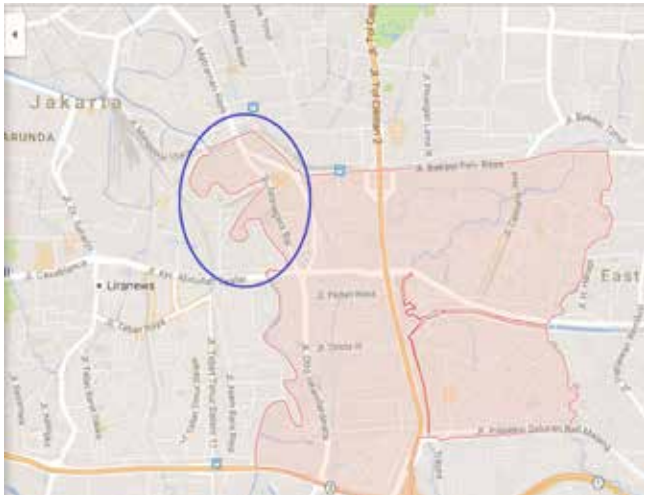


Figure1: Map of Kampung Melayu, Jatinegara sub-district, East Jakarta.
Source: Adapted from Google Maps

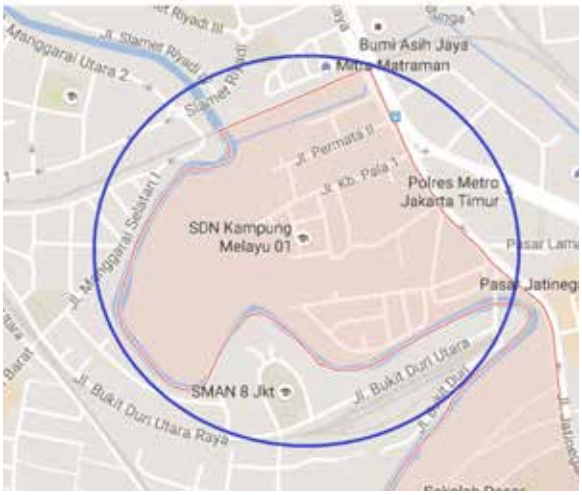


Figure 2: Map of case study location: Kebon Pala and Tanah Rendah, Kampung Melayu.
Source: Adapted from Google Maps

Some solutions for sheltering people have been proposed in response to flood events but they do not adequately address the needs of the Kampung Melayu community (Marfai, Sekaranom & Ward 2015). This paper outlines results of a study examining the resilience of the Kampung Melayu community during annual flood disasters.

## Kampung Melayu, Jakarta

The community of Kampung Melayu in Jakarta Timur was selected for the study due to its location in the centre of Jakarta, and its urban context, as well as being one of the more significantly affected riverbank communities on the Ciliwung River. Flooding has become more frequent and more severe over the past decades (Fiyanto 2014).

Kampung Melayu, is located in Jatinegara sub-district, East Jakarta (Figure 1). The focus area of this case study are the neighbourhoods of Kebon Pala and Tanah Rendah both are located within the Kampung Melayu precinct, less than 15 metres from the river (Figure 2).

Kampung Melayu was established in the 17th century by Malay communities from the Malay Peninsula (Chilmy & Widyawati 2013). During the Dutch colonial period in Indonesia between the 16th and 19th centuries, Kampung Melayu was a busy trading area (Chilmy & Widyawati 2013, Marfai, Sekaranom & Ward 2015). The Ciliwung River has traditionally been the busiest trading route, facilitating movement of goods and people. The location remains a principle hub for transportation in East Jakarta (Chilmy & Widyawati 2013). The main livelihood of the Kampung Melayu people is from trading, such as street vending or small business owners (Chilmy & Widyawati 2013). The current population is no longer predominantly of Malay descent. Most are migrants from other parts of Java Island including West, East and Central Java. These 'internal migrants' have settled in the area for at least three generations.

## Response to the Jakarta flood, 2013

The most recent worst floods in Jakarta in 2007 affected 60 per cent of Jakarta; being 89 villages including Kampung Melayu. The highest flood level occurred in Kampung Melayu, reaching 3.5 metres (Fiyanto 2014). During this event, the community in Kampung Melayu evacuated to a local mosque as a temporary shelter, particularly for children and the elderly. Assistance from the local government, political parties and the Red Cross came on the second day of the flood. However, response was not very successful, mainly due to a lack of coordination among responding organisations (Marfai, Sekaranom & Ward 2015).

Learning from the 2007 flood, in 2013, the Government of Jakarta City developed and implemented a Flood Contingency Plan through Jakarta Regulation No. 1, 2012, with support from the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) (Rakhmat 2013). The government established flood evacuation zones in 13 localities, incorporating 307 temporary shelters (Rahmat 2013). Kampung Melayu was one of the evacuation zones where the temporary shelters were made available. Public buildings, religious buildings, schools and open spaces were used to erect temporary shelters. Statistics from the Jakarta Regional Disaster Management Agency summarising the impact of the 2014 flood are shown in Table 1. Table 1 shows that Kampung Melayu ranked second for the number of people affected, second for the number of 'internally displaced people' (IDP) living in temporary shelters and second for the total number of IDP and temporary shelters.

Table 1: Impact of Jakarta flood of 2014.

| Area | | Number of People Affected | | | | Flood height (cm) | Number of days | Number of | |
|---|---|---|---|---|---|---|---|---|---|
| Sub-district | Urban Vilage | RW* | RT** | RK*** | People | | | IDPs | Shelters |
| Jatinegara | Bidara Cina | 13 | 99 | 4,736 | 16,563 | 20-300 | 18 | 5,995 | 21 |
| | K Melayu | 8 | 91 | 4,918 | 15,185 | 30-350 | 20 | 7,713 | 18 |
| Pasar Minggu | Pejaten Timur | 7 | 23 | 1,108 | 3,577 | 70-120 | 15 | 4,306 | 8 |
| Tebet | Bukit Duri | 4 | 36 | 1,358 | 7,139 | 10-200 | 18 | 7,139 | 14 |
| | Kebon baru | 6 | 41 | 2,277 | 10,546 | 10-300 | 16 | 10,546 | 7 |
| Kalideres | Tegal alur | 16 | 85 | 3,679 | 10,530 | 5-80 | 10 | 6,520 | 12 |

*RW Rukun Warga (Higher neighbourhood association consisting of several neighbourhoods.) associations
**RT Rukun Tetangga (Neighbourhood sssociation)
***RK Rukun Keluarga (Family)
Source: Adapted from Recapitulation of Flood Events in January 2014.

## Connection to place and disaster resilience

The monsoonal flooding events suggest that the community of Kampung Melayu has a resilience capability, developed in response to the experience of regular flooding events. According to Watson (2016, p. 24), resilience 'demonstrates that local areas can have the ability to withstand extreme natural events without suffering devastating losses, damage, diminished productivity or quality of life'. Further, socio-economic factors have been identified as the main contributor to the resilience of communities in disaster-prone areas (Hellman 2015). Hellman (2015) also argues that socio-economic factors are the main reason for community members to stay and deal with flooding rather than move permanently to safer locations that might threaten their capacity to maintain livelihoods. According to de Boer (2016), the resilience concept covers principles of preventing, preparing and responding to disaster and becomes the key issue of concern in humanitarian development. Similar concepts are raised by Sanderson (2016) who stated that pre- and post-disaster actions are part of a resilience-based approach. This concept is commonly applied by aid agencies to assist their response to developmental challenges or disasters (IFRC 2014).

While socio-economic factors support the resilience of communities in disaster events, this study argues that cultural and historical connections enable 'connecting to place' as a significant factor that helps people survive disasters and adapt to the impact. Therefore, relocating affected communities to safer locations is not always the answer and may contribute to other problems. For example, the community of Kampung Pulo accepted the resettlement program under the Normalisation of Rivers Project proposed by the Jakarta Government in cooperation with the World Bank (Hellman 2015). Under this program, the community relocated to high-rise, government-owned flats. As a result of the move, many residents lost their income and have been struggling with finances and to pay rent. The resettlement program has created insecurity in affected communities (Hellman 2015), not only socio-economically, but also in terms of culture and history. The historical and cultural values of communities in flood-prone areas have developed through, and are bound in with, everyday life. Ignoring these values in disaster response and mitigation is problematic and has negative impacts on the community (Rahmayati 2016, Sanderson 2016). However, resilience, as a community capacity does not diminish community needs for sustainable solutions in responding to and dealing with floods (Marfai, Sekaranom & Ward 2015). Enabling communities to design, procure and maintain temporary shelters and facilities that accommodate their needs without disconnecting them from their place, either permanently or temporarily, becomes critical in addressing the flood challenge.

## Method

The research method applied in this research is the case study approach. It consists of desktop research, field observation and ethnography through site visits and participatory research including interviews with community informants. It was supported by in-depth interviews with external stakeholders including urban experts, architects and planners, non-government and government representatives. The external stakeholders were chosen for their broad perspectives of the flood events and associated issues in Jakarta and to provide a comparison with the stated community experience.

In 2016, four site visits to Kebon Pala and Tanah Rendah were conducted to generate data through community consultations. Several other short follow-up visits were made to validate and verify the data with the communities and external stakeholders. The site visits

Figure 3: Two-storey houses with different quality of construction and materials.

Image: Yenny Rahmayati

were conducted in September and October 2016 and February and March 2017. The February visit was carried out during a flood event in order to observe the impact on the neighbourhoods and the people, and the combined local and government response to the disaster. It was followed by another site visit 12 days after the flood when community life had reverted to normal.

The site visits consisted of physical direct observation and informal conversations. Activities were conducted by a group of researchers with architecture, urban planning and building science backgrounds. The physical observations focused on the houses including the typology (construction, size, quality and appearance); accessibility (access to the main road and to the river); public buildings, public spaces and markets; streets and pathways and infrastructure and facilities. The observations were recorded using photographs, sketches and note-taking.

Participatory research with community members was carried out with people living closest to the river. About 45 people were involved in interviews; 60 per cent male, 40 per cent female, 70 per cent were adults and 30 per cent were elderly and children. Interview topics included individual background and personal experience. Between site visits, in-depth interviews with experts and external stakeholders were carried out to gain a broad perspective of flood problems and related issues in Jakarta. The data gathered from observation, participatory research through interviews and interviews with experts were recorded and analysed using a qualitative approach.

## Results

Research activity analysis revealed significant information about the lived behaviours of people in Kampung Melayu during flood events. Responses to flood events were strongly influenced by the village layout, network of streets, street widths and building form and typology. Most of the houses in the two neighbourhoods of Kampung Melayu are two-storey (Figure 3) and densely populated houses with narrow lanes (Figure 4). The location has easy points of access and is located very close to the main arterial road in East Jakarta. However, there is a range of lane widths across the settlement, resulting in different neighbourhoods having varying degrees of access. Some laneways widen to create spaces used for community interaction and small markets. Public buildings and spaces identified

Figure 4: Narrow lanes between houses.

Image: Yenny Rahmayati

in the precinct included a food market, a school, some *mushollas* (small mosques) and a volleyball field.

In some areas, there are no open sites in a safe place on higher ground suitable for erecting temporary emergency shelters provided by government and agencies. The area has limited sanitation facilities. Not all the houses have toilets, some rely on an inadequate public toilet. In some places, a public toilet serves one residential cluster (about 50-80 people). A clean water supply relies on ground water with reticulation by electric pump. When this fails, and there are no clean drinking water facilities available, residents have to boil water before drinking or buy bottled drinking water.

The only public open site available in the flood-prone lower area is a volleyball field. There is no other appropriate open site available in safer zones on higher ground for temporary shelter. A yard of the primary school is available but has limited space to adequately accommodate the whole community.

This flood-affected area is included in the government's urban redevelopment program that requires residents to move out from the location permanently. The community rejected the relocation plan for livelihood reasons (as they might lose their job or income from small businesses) and because of their multi-generational connection to Kampung Melayu. Residents feel connected to the place, and their historical-cultural bond has been strengthened by their shared experience during flooding. One community member (female 65) said:

> *We don't want to be removed from here, this is our place, we've been living here for generations, even I was born here, my children born here, my grandchildren born here, we like living here, the place, the people, we feel like one family here.*

Relocating to high-rise flats is qualitatively different from their current living arrangements and breaks neighbourhood structures. Broader community networks are affected as different neighbourhoods may be relocated separately. This has been experienced by the residents of nearby Kampung Pulo neighbourhood when they were resettled.

Kampung Melayu residents not only refuse to be relocated under government relocation programs, they are also reluctant to be evacuated during flood events. Another community member (female 30) said:

> *If possible, we prefer not to be evacuated, only if the situation really becoming worse and life threatening, because we want to keep watching our belongings. Living in a temporary shelter is stressful, not comfortable at all, limited space, not enough facilities, we and our kids have to sleep on the floor. We don't like it. No one like it.*

Many residents have lived in Kampung Melayu their entire lives and the community has built an adaptive capacity to respond to floods. For example, if flooding is less than a half metre, people move to the second floor of their houses and access other buildings via the streets (Figure 5). However, it the flood increases to three metres access and egress becomes difficult and they evacuate to safer areas in nearby neighbourhoods. They move their valuable belongings (mostly TVs, fridges, gas stoves, fans), food and groceries to the second floor and lock the house. They relocate livestock (mostly chickens) and vehicles (bikes and motor scooters) to safer areas along the road or in the vicinity of temporary shelters. The men travel between temporary shelters and their houses to ensure their property and stored belongings and valuables are safe.

Figure 5: Kampung Melayu during a minor flood event in February 2017.

Image: Vivien Himmayani

During this recent flood event, one of the *mushollas* was used as a temporary shelter (Figure 6). However, due to space limitations, only women and children were sheltered there.

A private primary school established in the location and managed by a religious organisation was used as temporary shelter space during the flood (Figure 7). However, due to the space limitation, it could only accommodate the members of the organisation. According to community members, additional facilities needed during flood events are sanitation and toilet facilities, clean water, electricity and water-based transportation.

Flood events can last for a few days up to two weeks. People expressed their preparedness to adapt to the situation for this period of time. During post-disaster periods, community members participate in community-led recovery and clean-up activities. This usually focuses on public services and infrastructure rehabilitation, then moves to adversely affected houses. Once each neighbourhood is cleared of silt and debris, they return to normal life. Community leaders contribute significantly to leading the recovery. This behaviour, through repeated flood events, has created deep community connection and strengthened the capacity to respond to each event.

## Discussion

The Kampung Melayu community face many problems, including:

- lack of facilities, especially access to sanitation and clean water
- lack of privacy
- space limitations
- effects of humidity
- water damage to buildings
- mould build-up and related health effects
- maintaining continuity of livelihood
- security problems caused by disruption and loss of control of private space.

These problems are unproblematic, not only for those who choose to stay in their houses, but for those who are evacuated. Resilience does not mean that the community and its residents thrive under the conditions of annual flooding. The community needs solutions and interventions to help them remain as a community during flood events, with improved comfort, amenity, health and safety. The longer-term solution is to design and prototype shelter, health facilities and responses


Figure 6: Inside a *musholla* as a temporary shelter.

Image: Vivien Himmayani and Yenny Rahmayati

to livelihood continuity and to improve the community's quality of life.

Community consultations to date have identified several key community preferences in the design of interventions. The preference is to have better temporary shelter with appropriate support facilities, to help them remain in their houses and neighbourhoods. This was supported by one community member (a male 50):

> *We don't' want to be relocated, it cost us rental fee, and we may lose our income. We like living here with neighbours, of course we don't like flood but it would be better if we also have better temporary shelter during the flood, if possible not so far from our homes.*

Based on observed patterns of lived behaviour in this study, the main challenge in designing better temporary shelters is how to find approaches that accommodate the needs of the community without disconnecting them from their place, temporarily or permanently. A solution may be to develop and implement a community-led design process with high-level local participation.

A co-design or participatory design process delivering better results, tested in context and with higher levels of community acceptance through local ownership and commitment will sustain the intervention (Wates 1999).

Other important issues raised in this study:

- Flexibility: shelters and facilities should conform to the conditions, supported with appropriate infrastructure, although not necessarily permanently.
- Security: shelters should be secure, private and be erected in the right locations with easy access for loading and distribution.
- Portable shelters and facilities: these should be stored in places to allow quick deployment. Multiple storage sites may be needed and these must be secure, protective of equipment and materials accessible during different flood levels.

Questions regarding the nature of shelter and facilities, especially given the lack of open space, remains. Some forms of shelter can be erected inside larger buildings such as schools and *mushollas*. Indoor shelter is better matched to small to medium-scale events.


Figure 7: The local school as a temporary shelter.

Image: Vivien Himmayani

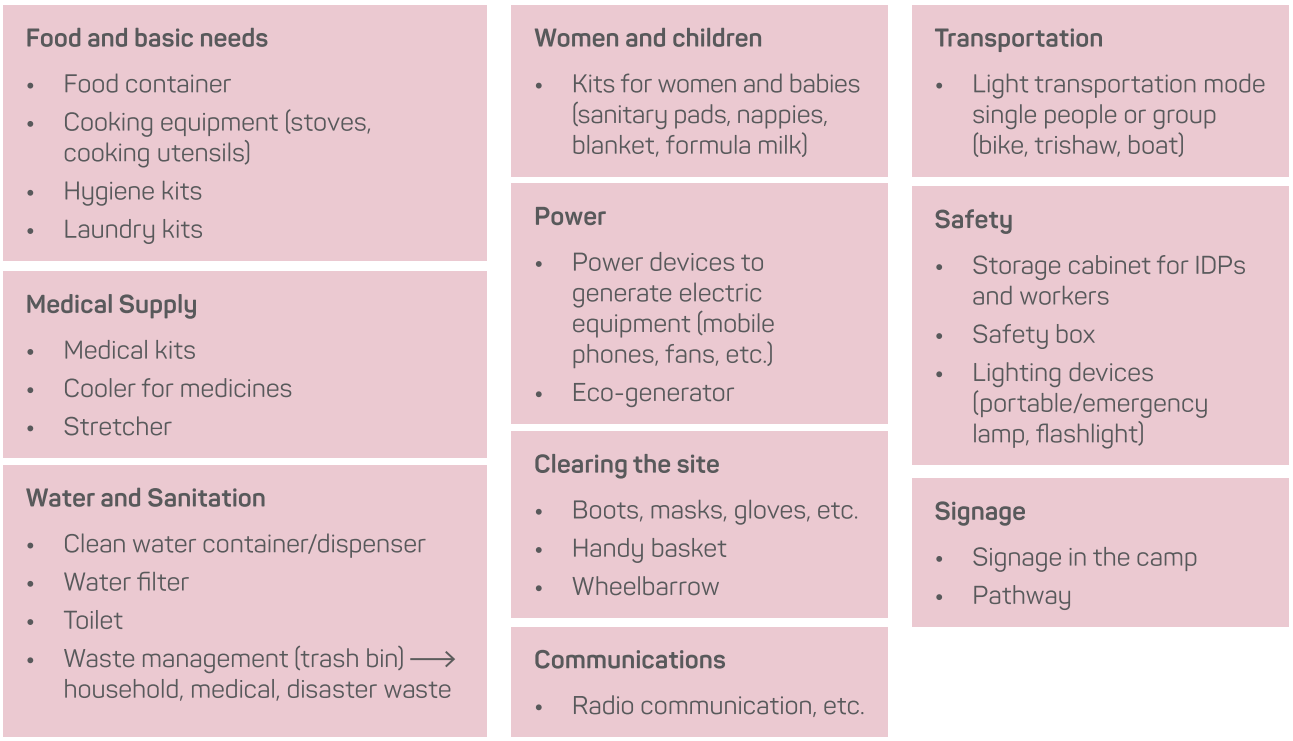


Figure 8: Facilities and products complementary to temporary shelters for flood disaster.

According to experts consulted, communal shelters are better for large-scale or long-term disasters as the provision and management of services, logistics and security is easier.

There is a long history of evidence from the Appropriate/Intermediate Technology movement dating from the 1960s of the benefits to small communities of local involvement, not just in the design of technology, but in the making and maintenance of technology (Fathy 1979, Hamdi 1991, Schumacher 1999, Willoughby 1990, Papanek 1991). Such benefits include empowering people by giving them control of the technology, strengthening local technical and organisational capacity (especially through erection, dismantling and management processes) and developing local livelihoods. Design briefs should include sustainable materials and methods and processes at an affordable cost and with appropriate durability to promote low maintenance. Alternative materials and systems may be needed if local resources are limited. Deployment methods for any new shelter systems must also be part of the design process, including storage, distribution and construction during flood events. The facilities most needed to support the design and deployment of temporary shelter systems are likely to require a degree of permanence: public kitchens, sanitation facilities, electricity generation and clean water.

Due to space limitations in the case study location, any outdoor communal temporary shelter is problematic and a low priority for targeting of resources. Therefore, the designs should be focus on the improvement of the current locations and buildings used as temporary shelters, such as the local *musholla* and school. The improvements should be on the additional facilities needed and the alternative solutions possible to make people comfortable and less stressed during evacuation periods. There is also an urgency to identify vulnerable groups in the design process including women, children and the elderly and to design specific services and shelter types to meet their needs. Alternative designs include portable shelters for single family use, using balconies and other external spaces. Based on the inputs from the community and external experts, some options for facilities are proposed in Figure 8, as complementary to temporary shelters.

The next stage of the project will commence in late 2017, with a series of community-led design workshops on site with community representatives as well as staff, researchers and students from Binus University, Indonesia and Swinburne University of Technology, Australia. Other stakeholders such as non-government and government representatives will be invited.

## Conclusion

In this study, the identified, lived behaviours of the residents of Kampung Melayu community and its neighbourhood precincts in responding to annual flood events demonstrates a high degree of community resilience. Such behaviours shows that cultural and historical connection to place is a significant driver of their desire to remain in their flood-affected riverbank location on the Ciliwung River. This paper outlined a community-led design approach to create innovative and appropriate temporary shelter and technical interventions to support community preferences to permanently remain in place. The approach combines

community participation as well as advice and input from experts to enable flood-affected communities to produce satisfactory designs in accordance with their immediate and future needs. Further, it is possible that the outcomes of this design approach are applicable to any urban flood events in modern urban villages, not only in developing countries but also in developed cities in the Asia-Pacific region.

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# North Australia and Rangelands Fire Information

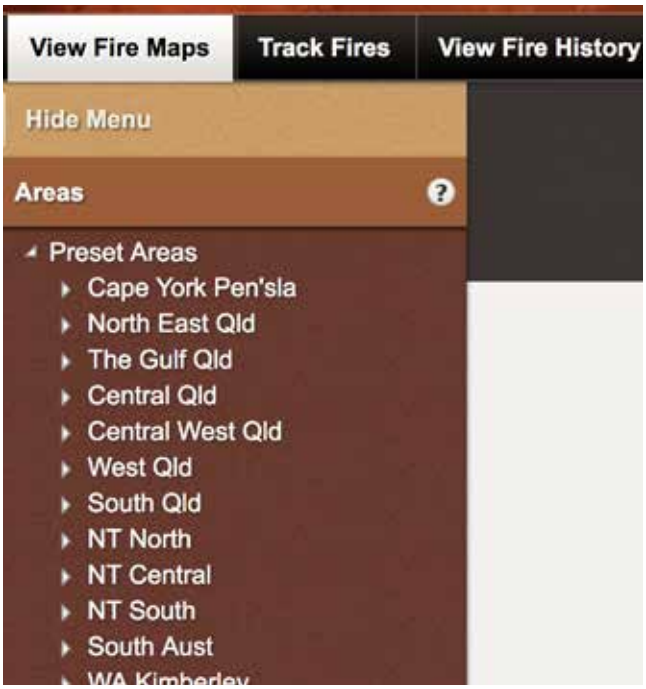
The North Australia and Rangelands Fire Information (NAFI) website is a resource for viewing and tracking current fire activity in Australia's northern and remote areas. The maps cover the Northern Territory, Queensland, most of Western Australia and South Australia.


The website tracks current fires and publishes them on a map of Australia using a visual representation of 'hotspots'. Hotspots are produced from thermal (heat) sensors on a number of different satellites including NOAA and NASA.

NAFI also produces burnt-area maps that are updated throughout the year. They are produced by comparing different satellite images, generally 1-2 weeks apart, and identifying the areas that have been burnt. Firescars are sourced from the Darwin Centre for Bushfires at Charles Darwin University in Darwin.

The NAFI website was developed in 2002 by the community of fire researchers and fire managers involved in the Tropical Savannas Cooperative Research Centre providing regularly updated maps of active fires and burnt areas in the open Australian rangelands.

NAFI website: www.firenorth.org.au



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